This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

**Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

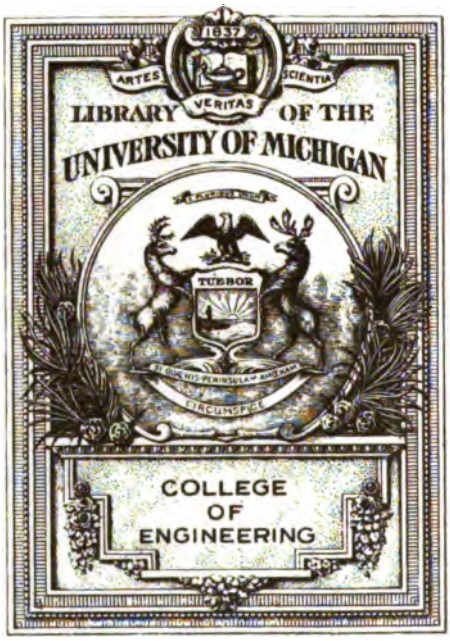
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

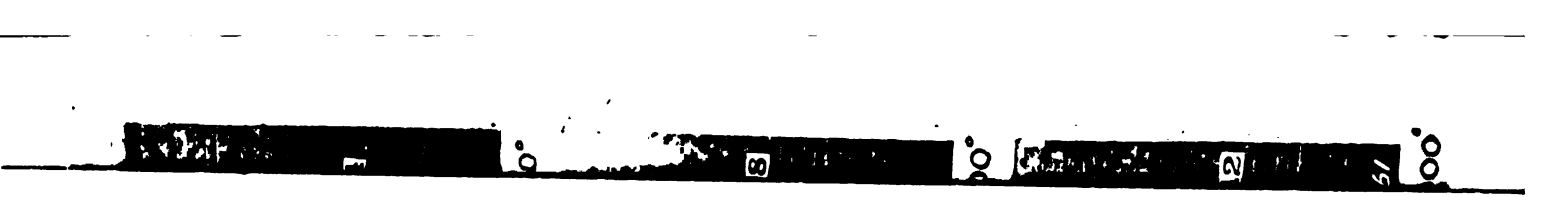
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

**About Google Book Search**

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`


1837
ARTES
SCIENTIA
VERITAS
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
TUEBOR
COLLEGE
OF
ENGINEERING

TH
9537
.B86



*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 49.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH DOORS.

## A $2\frac{5}{8}$-in. DOOR OF ARCHANGEL DEAL, CONSTRUCTED IN THREE THICKNESSES.

## A $2\frac{5}{8}$-in. DOOR OF QUEBEC PINE, CONSTRUCTED IN THREE THICKNESSES.

## Particulars

OF

## EXPERIMENTAL FIRE TESTS.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
*(Founded, 1897—Incorporated, 1899),*
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

No. 1.—WHAT IS FIRE PROTECTION?
No. 2.—AMERICAN OPINIONS ON FIRE PROTECTION.
No. 3.—THE PARIS BAZAAR FIRE.
No. 4.—THEATRE EXITS.
No. 5.—THE NEW YORK FIRE DEPARTMENT
No. 6.—COTTON FIRES AND COTTON BALES.
No. 7.—"FIRE-RESISTING" FLOORS USED IN LONDON.
No. 8.—FIRE SERVICE IN FACTORIES, WORKS, &c.
No. 9.—LESSONS FROM FIRE AND PANIC.
No. 10.—HOW TO BUILD "FIRE-PROOF."
No. 11.—THE TESTS WITH UNPROTECTED COLUMNS.
No. 12.—THE EFFECT OF FIRE.
No. 13.—THE TESTING STATION OF THE B.F.P.C.
No. 14.—OFFICIAL FIRE TESTS WITH FLOORS (No. 1).
No. 15.—CONFLAGRATIONS DURING THE LAST TEN YEARS.
No. 16.—EXPERIMENTAL FIRE TESTS WITH FLOORS (A).
No. 17.—THE TALL BUILDING UNDER TEST OF FIRE.
No. 18.—EXPERIMENTAL FIRE TESTS WITH FLOORS (B).
No. 19.—OFFICIAL FIRE TESTS WITH CEILINGS (No. 2).
No. 20.—OFFICIAL FIRE TESTS WITH GLAZING (No. 3).
No. 21.—EXPERIMENTAL FIRE TESTS WITH FLOORS (C).
No. 22.—EXPERIMENTAL FIRE TESTS WITH PARTITIONS (D & E).
No. 23.—OFFICIAL FIRE TESTS WITH FLOORS (No. 4).
No. 24.—EXPERIMENTAL FIRE TESTS WITH DOORS (G, H AND I).
No. 25.—EXPERIMENTAL FIRE TESTS WITH DOORS (K AND L).
No. 26.—EXPERIMENTAL FIRE TESTS WITH DOORS (M AND N).
No. 27.—OFFICIAL FIRE TEST WITH PARTITIONS (No. 7).
No. 28.—OFFICIAL FIRE TESTS WITH CEILINGS (No. 8).
No. 29.—OFFICIAL FIRE TESTS WITH GLASS (No. 5).
No. 30.—OFFICIAL FIRE TESTS WITH GLASS (No. 6).
No. 31.—OFFICIAL FIRE TESTS WITH GLASS (No. 11).
No. 32.—OFFICIAL FIRE TESTS WITH GLASS (No. 12).
No. 33.—EXPERIMENTAL PLAIN GLASS TESTS (O, P AND Q).
No. 34.—EXPERIMENTAL FIRE TESTS WITH FLOORS (R).
No. 35.—EXPERIMENTAL FIRE TESTS WITH DOORS (S AND T).
No. 36.—OFFICIAL FIRE TESTS WITH TREATED WOOD (No. 9).

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.,C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.
SIR DOUGLAS FOX, President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
THE RIGHT HON. THE EARL OF STRADBROKE.
ALEXANDER STENNING, F.R.I.B.A.
SIR ARTHUR SULLIVAN, Mus. Doc.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President, The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A.
District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C.E., M.I.Mech.E.,
Past President, Municipal Electrical Association.

*Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL, AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*
LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W

*Resident Engineer:*
T. KISSACK.

*Hon. Secretary:*
GEORGE E. MONCKTON, M.A.

*Offices:*
1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE.*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

The report presented in this publication again shows the results obtained in two door tests. The teak door used in this case had been condemned by a district surveyor as not complying with the Building Act, the panels being constructed in two thicknesses and the total thickness being insufficient.

The deal door was one that was specially constructed for the purposes of this test and was in three thicknesses, the thicknesses being held together by deal pins.

This publication should be read together with the reports on other door tests, particularly in this case with the door tests with three thickness doors held together with clasp nails (Publication No. 49).

EDWIN O. SACHS.

*October 1st*, 1900.

SOTHERAN

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

# EXPERIMENTAL FIRE TESTS

*CONDUCTED BY THE EXECUTIVE*

OF THE

# British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

## FIRE TEST Da, Ea.—MARCH 28TH, 1900.

(Da) A $2\frac{3}{8}$-in. Door of Archangel Deal, constructed in three thicknesses.

(Ea) A $1\frac{5}{8}$-in. Door of Teak, flush panelled on each side, the panels being in two thicknesses.

### OBJECT OF TEST.

To record the effect of a fierce fire ot one hour, gradually increasing to a temperature of 2,000° Fahr.

*Note.*—The fire was to be applied from one side, and the doors were to open inwards on to the fire side.

*Note.*—The door-openings were to be approximately 3 ft. by 7 ft.

### SUMMARY OF EFFECT.

#### DEAL DOOR.

In 53 minutes flame appeared on the outside through the vertical joint between boards in centre of door just above the sill.

In 66 minutes a hole about 6 inches square was burnt through door in centre just above sill, and also a small hole level with top bolt in second joint from east side, there was no other sign of damage on the outside.

At the conclusion of the test the door remained in position.

After conclusion of the test it was seen that the two inner thicknesses were practically gone.

### Teak Door.

In 16 minutes flame appeared over the top of door.

In 53 minutes the whole of the top rail of door was burning, and flame also appeared between joints of lower panels and muntin.

In 58 minutes the west portion of top rail fell.

In 65 minutes the greater part of the door fell, leaving the east style, a portion of the west style and the bottom rail in position, but much burnt.

*Note.*—The duration of the test was 71 minutes, or 11 minutes beyond the hour defined in the "Object of Test."

## DESCRIPTION OF THE TESTING PLANT.

(*See Figs.* A, B, C *and* D.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 6 Hut.

The hut was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

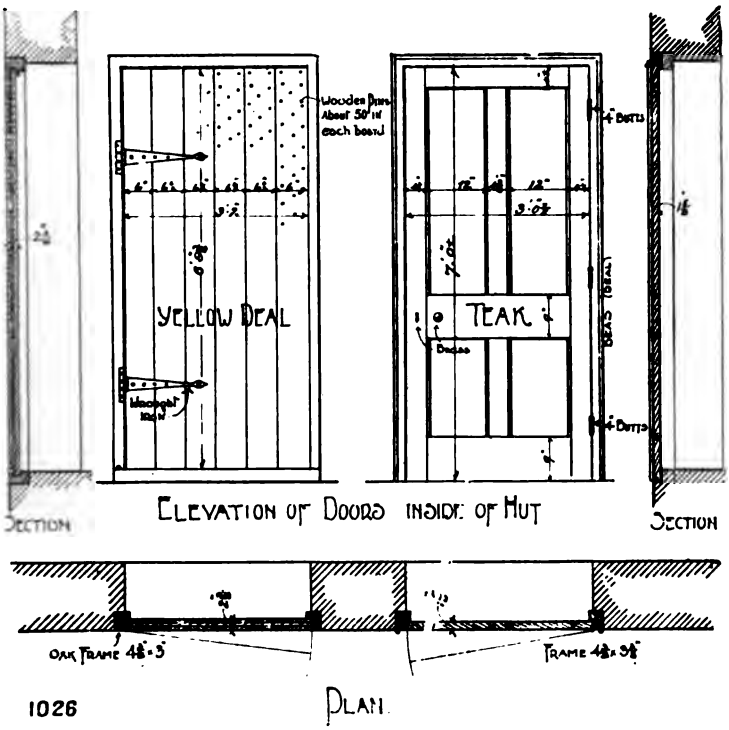
The ceiling of the hut was 9 ft. 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire-clay. The chamber in which the fire was measured 10 ft. by 7 ft. 10 in.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

Observation Hole
102

The gas was admitted through two mixing chambers of fire-brick, as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3 and 4, points Nos. 2 and 3 being outside the doors, and the others on the fire side of the doors. A continuous record was also taken from point No. 5.




DETAILS OF DOORS. *Figs.* E *and* F.

There were observation holes in the east and west walls, closed by moveable iron shutters.

The draught holes were in the east and west walls.

The photographs were taken partly by daylight and partly by flashlight.

A brick wall, 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from east to west. It was built 13 in. back from the main wall, the wall was carried up to the ceiling, the height between the floor and the ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

TEAK. DEAL.

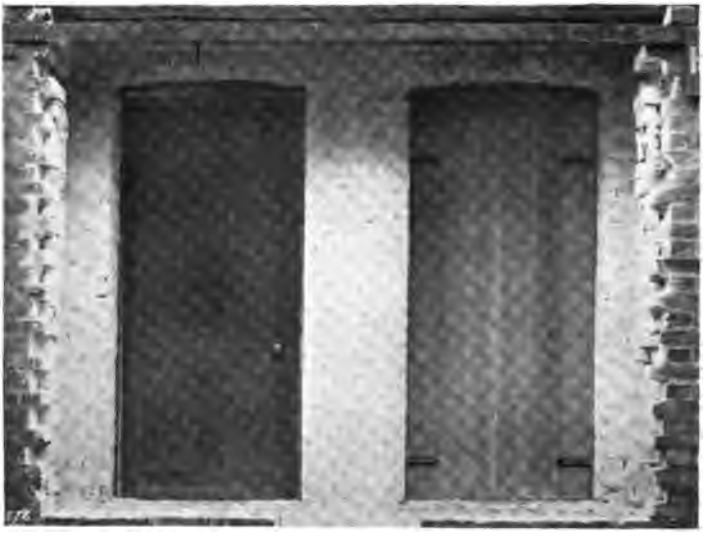


*Fig.* 6. VIEW OF DOORS BEFORE TEST (FROM OUTSIDE).

## CONSTRUCTION OF THE DOORS.

On March 26th the doors were put into position. The door on the east side was of teak, and that on the west side of clean yellow deal from Archangel.

### DEAL DOOR.

The deal door was 3 ft. 2 in. wide by 6 ft. $9\frac{3}{8}$ in high, $2\frac{3}{8}$ in. thick, constructed of three thicknesses of boards, the middle thickness being horizontal, and the outer

ones vertical. The boards were butt jointed; they were secured together with $\frac{3}{8}$ in. deal double wedge-shaped pins, driven in from both sides, about fifty to each board. The top and sides of door were splayed to fit the splayed rebate on frame.

The door was hung on two wrot iron cross garnet hinges, the door was fastened with four 6-in. iron neck barrel bolts to a frame of oak, $4\frac{3}{8}$ in. by 3 in., with a splayed rebate, the screws to secure the bolts being $1\frac{1}{4}$ in. long and only driven into the outer thickness. The frame was secured to the brickwork by spikes driven into deal plugs inserted in the joints of the brickwork.

### Teak Door.

The teak door was 3 ft. $0\frac{7}{8}$ in. wide by 7 ft. $0\frac{1}{2}$ in. high, $1\frac{3}{4}$ in. thick, four panel, bead butt both sides, the panels being flush each side, the panels being in two thicknesses.

The styles and top rail were $4\frac{1}{4}$ in. wide; the centre and bottom rails were 9 in. wide. The panels were tongued into the styles and rails. The door was hung with three 4-in. wrot iron butt hinges and secured with a 5-in. mortice lock and brass furniture, to a teak frame $4\frac{3}{8}$ in. by $3\frac{3}{8}$ in., with a $\frac{1}{2}$ in. rebate. The frame was secured to the brickwork by spikes driven into deal plugs inserted in the joints of the brickwork.

The frames were pointed all round with mortar.

## THE TEST.

*(See Figs. 1 to 12, E to L).*

On March 28th, 1900, the test was undertaken.

The following is a log of the test:—

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:—State of weather, overcast; Rain, none; Wind, N.N.E.; Barometer, 29·54 in.; Attached Thermometer, 43° Fahr.; Dry Bulb, 39·2° Fahr.; Wet Bulb, 36·8° Fahr.; Remarks, dull afternoon, cold, hazy.

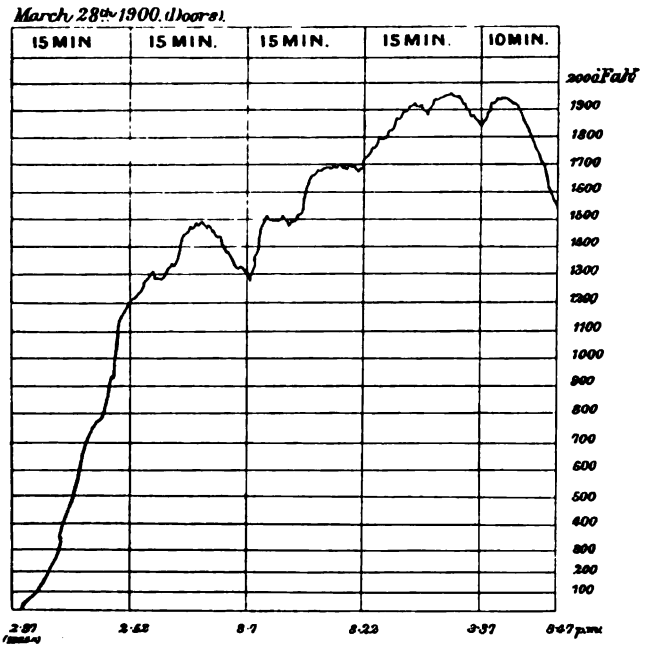
The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4, and the diagram on next page shows the continuous record from point No. 5.

## Observations Taken at Points Nos. 1, 2, 3 & 4.

*From 2.39 p.m. to 3.48 p.m.*

| Time. | Inside. | | Outside. | |
|---|---|---|---|---|
| | No. 1. Fahr. | No. 4. Fahr. | No. 2. Fahr. | No. 3. Fahr. |
| 2.39 p.m. | 300° | 110° | — | — |
| 2.42 „ | 100° | 150° | — | — |
| 2.45 „ | 500° | 875° | — | — |
| 2.48 „ | 1,100° | 1,200° | — | — |
| 2.51 „ | 1,200° | 1,300° | — | — |
| 2.54 „ | 1,200° | 1,300° | — | — |
| 2.57 „ | 1,350° | 1,410° | — | — |
| 3.0 „ | 1,350° | 1,440° | 103° | — |
| 3.3 „ | 1,240° | 1,340° | 105° | — |
| 3.6 „ | 1,302° | 1,460° | 103° | — |
| 3.9 „ | 1,390° | 1,490° | 150° | — |
| 3.12 „ | 1,400° | 1,610° | 200° | — |
| 3.15 „ | 1,580° | 1,675° | 275° | — |
| 3.18 „ | 1,550° | 1,630° | 345° | — |
| 3.21 „ | 1,625° | 1,740° | 380° | — |
| 3.24 „ | 1,700° | 1,820° | 550° | — |
| 3.27 „ | 1,780° | 1,860° | 730° | — |
| 3.30 „ | 1,850° | 1,900° | 890° | — |
| 3.33 „ | 1,800° | 1,850° | 1,080° | — |
| 3.36 „ | 1,750° | 1,800° | 1,060° | — |
| 3.39 „ | 1,800° | 1,860° | 1,410° | — |
| 3.42 „ | 1,700° | 1,750° | 1,300° | — |
| 3.45 „ | 1,490° | 1,550° | 1,160° | 105° |
| 3.48 „ | 1,400° | 1,450° | 1,050° | 100° |

## Automatic Record at Point No. 5.




### Deal Door.

*Observations on the Outside.*

At 2.37 p.m. the gas was lighted. (See Fig. G.)

### Teak Door.

*Observations on the Outside.*

At 2.37 p.m. the gas was lighted. (See Fig. G.)

At 2.39 p.m. smoke came through the joint between top of door and frame.

DEAL DOOR—*continued.*

At 2.44 p.m. smoke came through the joint between top of door and frame at west corner and for about 12 inches down west side.

TEAK DOOR—*continued.*

At 2.53 p.m. flame appeared intermittingly over top of door at west corner.

At 2.55 p.m. flame appeared all along the top of door.

At 3.0 p.m. the top of door was twisted inwards $\frac{3}{4}$ in. at west side and $\frac{1}{4}$ in. at east side.

At 3.0 p.m. flame appeared about 15 in. down west side of door from top.

At 3.24 p.m. flame appeared through keyhole, and through the wood around lock, the flame over door increasing, top rail being much burnt.

At 3.26 p.m. door bulging outwards in centre, about middle of upper panels.

| Deal Door—*continued.* | Teak Door—*continued.* |
| --- | --- |
| At 3.30 p.m. first appearance of flame through the joint between boards in centre of door above sill, about 2 in. long. | At 3.30 p.m. the whole of the top rail of door was burning and flame beginning to extend down style and panel on the west side. Flame also appeared between east lower panel and muntin at bottom. |
| At 3.35 p.m. flame appeared through centre board at bottom where one of the pins had been burnt through. (See Fig. I.) | At 3.35 p.m. flame appeared between joints on both sides of west lower panel and on west side of east lower panel; whole height of panel, west portion of top rail fallen in. (See Fig. I.) |
| At 3.42 p.m. a hole about 6 in. square was burnt through the door in centre above sill, and also a small hole level with top bolt in second joint from east side, but there was no other sign of damage on the outside. (See Fig. L.) | At 3.42 p.m. the greater part of the door fell, leaving the east style, a portion of the west style and the bottom rail in position, but much burnt. (See Fig. L.) |
| At 3.48 p.m. the gas was shut off. | At 3.48 p.m. the gas was shut off. |
| At 3.49 p.m. water was applied to the outer face of door for two minutes. | |

DEAL DOOR—*continued.*

*Observations on the Inside.*

At 2.44 p.m. the face of the door commenced to blaze all over.

At 3.30 p.m. the whole of the inner thickness of the door had fallen except some small portions, and the lower hinge was quite clear of door.

TEAK DOOR—*continued.*

*Observations on the Inside.*

At 2.44 p.m. the face of door commenced to blaze all over.

DEAL. TEAK.

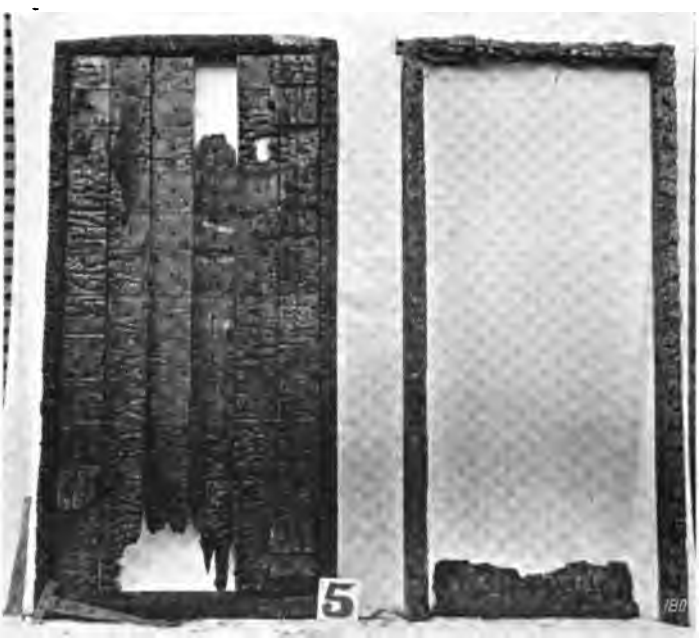



*Fig.* M VIEW OF DOORS SHOWING CONDITION OF INSIDE AFTER REMOVAL.

## OBSERVATIONS AFTER TEST.

### DEAL DOOR.

The whole of the inner thickness was gone, also almost all the middle thickness, except some fragments down each side. (See Figs. M and N.)

### TEAK DOOR.

The styles which remained up when remainder of door fell were badly burnt and fell shortly after. The lower rail was also much burnt. (See Figs. M and N.)

On the 29th March the doors were removed and photographs shown in Figs. M and N were taken.

TEAK. DEAL.

*Fig.* N. VIEW OF DOORS SHOWING CONDITION OF OUTSIDE AFTER REMOVAL.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this kind, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. Max Clarke, A.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. Matt Garbutt, A.M.Inst.C.E.

Mr. Thomas Kissack (Resident Engineer at the Testing Station) assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended the Instrument Room.

The Council was represented by :—
Sir John Taylor, K.C.B. (H.M. Office of Works).
Mr. Arthur Cates, F.R.I.B.A. (late Surveyor, Crown Estates).

The Executive was represented by :—
Mr. Edwin O. Sachs (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E.
Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.

The Members' Testing Sub-Committee was represented by :—
Mr. George E. Monckton, M.A.

The general body of members was represented by :—
Mr. F. Sizer Capon, Architect's Department, London County Council.
Mr. Arthur Crow, F.R.I.B.A., District Surveyor, Whitechapel.
Mr. Bernard Dicksee, A.R.I B.A., District Surveyor, E. Newington.
Mr. E. Dru-Drury, F.R.I.B.A., District Surveyor, St. Margaret's.

*Fig.* 11. VIEW OF DOORS SHOWING CONDITION AFTER 50 MINUTES.

*Fig.* 1. VIEW OF DOORS SHOWING CONDITION AFTER 60 MINUTES.

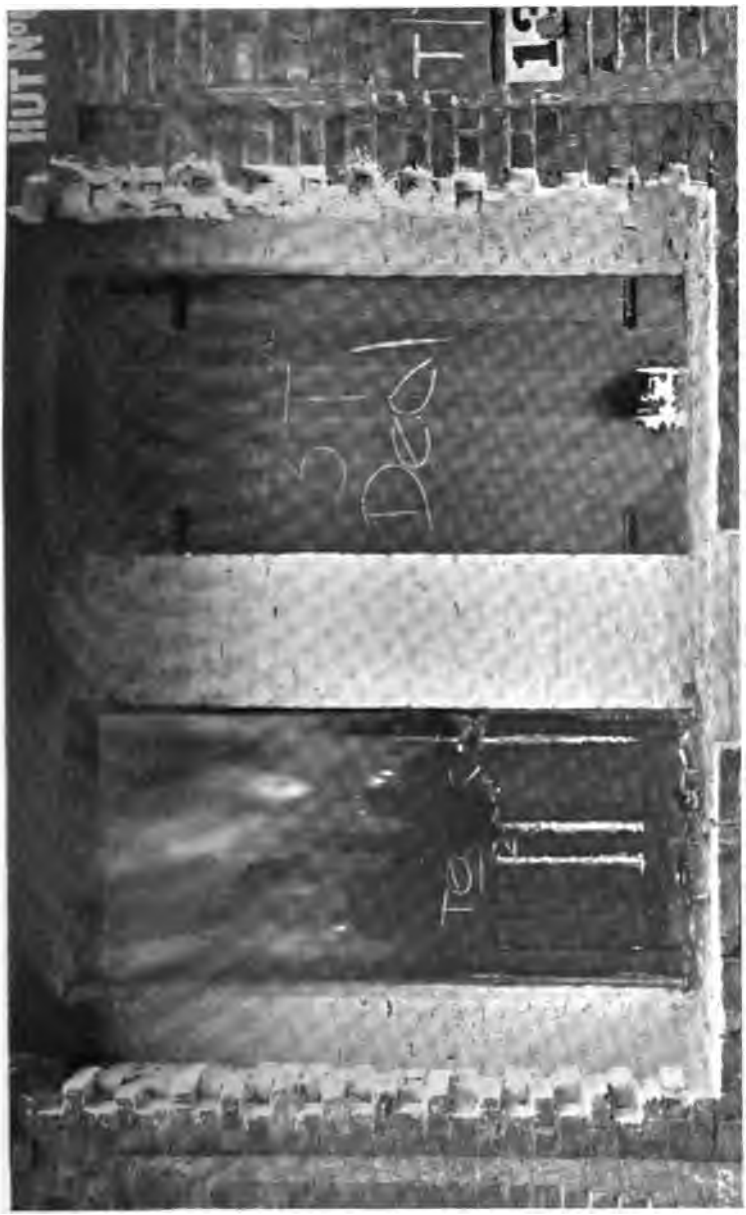



*Fig.* K. VIEW OF DOORS SHOWING CONDITION AFTER 63 MINUTES.

*Fig.* L. VIEW OF DOORS SHOWING CONDITION AFTER 65 MINUTES.

Mr. J. H. Dyer, Vice-President, National Fire Brigade Union.
Mr. F. E. Eiloart.
Mr. A. Fearnhead.
Mr. W. Grellier, F.R.I.B.A., District Surveyor, Clapham.
Mr. F. W. Hamilton, A.R.I.B.A., District Surveyor, North Fulham.
Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, Southwark.
Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington.
Mr. H. McLachlan, A.R.I.B.A., District Surveyor, Western Division, City of London.
Mr. J. P. Norrington, A.M.Inst.C.E., Surveyor, Lambeth.
Mr. R. F. P. Notley, F.R.I.B.A., F.S.I., District Surveyor, Bethnal Green.
Mr. W. Weaver, M.Inst.C.E., Surveyor to the Vestry of St. Mary Abbots, Kensington.

The Commercial Section was represented by :—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman).
Lieut.-Col. J. Colquhoun.
Mr. Gilbert Davenport (The Expanded Metal Co.).
Mr. J. A. King (Messrs. J. A King & Co.).
Mr. J. D. O'Brien (The Columbian Fireproofing Co.).
Mr. H. Salmon (The Expanded Metal Co.).
Mr. H. Brome Tarry (The British Uralite Co.).
Mr. J. F. Golding (The Expanded Metal Co.).
Mr. D. R. Radcliff (The Ratner Safe Co.).
Mr. Alfred Williams (Messrs. G. A. Williams & Son).

The following visitors attended by special invitation of the Executive :—

Mr. A. Howard Colls.
Mr. T. Costigan (Sec. Builders' Institute).
Mr. Coward.

Mr. Howard Dru Drury.
Mr. R. J. Friswell.
Mr. T. E. Gatehouse, F.R.S.Ed.
Mr. A. E. Buthrey.
Mr. H. E. Hamsley.
Mr. E. R. Marsland.
Mr. W. G. Perkins.
Mr. Harry Rogers.
Mr. E. S. Young.

Signed,

*For the Sub-Committee conducting the Test:*
MAX CLARKE (*Directing Member*).

*For the Commercial Section:*
FREDERIC R. FARROW.

*For the Executive:*
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S TAYLOR
(*Asst. Secretary*).

*Date—October 1st*, 1900.

VIEW OF THE WINDOW AND DOOR, PROTECTED BY THE FIRE BLINDS. *Figs.* 1 *to* 6.

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 51.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS

WITH

# FIRE-RESISTING CURTAINS

AND

# BLINDS.

---

TWO FIRE BLINDS

KNOWN AS THE

"WILLIAMS" FIRE BLINDS,

INSTALLED BY

G. A. WILLIAMS & SON,

BAYSWATER, LONDON.

---

## The Committee's Report.

---

*ALL RIGHTS RESERVED.*

---

LONDON, 1900.

PUBLISHED AT THE OFFICES OF

THE BRITISH FIRE PREVENTION COMMITTEE

*(Founded, 1877—Incorporated, 1899).*

1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARLYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superindending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32-oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete.

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

..... ..... ..... .....

*Chairman of the Executive:*

EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; Past President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.
SIR DOUGLAS FOX, Past President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
ALEXANDER STENNING, F.R.I.B.A.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
MATT. GARBUTT, A.M.Inst C.E., A.R.I.B.A.
T. E. GATEHOUSE, F.R.S.Ed., A.M.Inst.C.E.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C E
F. HAMMOND, F.R.I.B A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.

*Chairman of the Commercial Section:*

FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*

WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*

JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*

LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*

T. KISSACK.

*Assist.-Secretary:*

H. S. TAYLOR.

*Offices:*

1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE.*

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

As remarked on an earlier occasion, the question of protecting door and window openings by the application of some form of blind is a matter of importance to those who have premises overlooking narrow thoroughfares, or share light and air from mutual areas with adjoining owners. Nowhere was the absence of such fire blinds more felt than in our Metropolis on the occasion of the great Cripplegate fire.

The Report herewith presented deals with a form of fire blind intended primarily for the protection of windows which face dangerous property, and the test was mainly to demonstrate that an ordinary window, which would very rapidly succumb to heat if unprotected, can be guarded for a time even against high temperatures and the occasional impingement of flame. It is a question of gaining time for the fire brigade that is of such great importance, and bearing this in mind, the present contribution to the Committee's records should be of considerable value.

SOTHERAN

EDWIN O. SACHS.

LONDON,
*November* 10*th*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

THE BLINDS. *Fig.* 13. VIEW AFTER OPENING WINDOW AND DOOR, 15 MINUTES AFTER CONCLUSION OF TEST.

OFFICIAL REPORTS

OF THE

# British Fire Prevention Committee.

[FOUNDED 1897—INCORPORATED 1899]

FIRE TESTS Nos. 25, 26.—MAY 23RD. 1900.

## TWO FIRE BLINDS,

KNOWN AS

## THE "WILLIAMS" FIRE BLINDS,

INSTALLED BY

G. A. WILLIAMS & SON,

BAYSWATER, LONDON.

### OBJECT OF TEST.

To record the protection against fire afforded respectively to a window and to a door, when screened from the flames by rolling fire blinds which can be put into position in a few seconds; the fire to have a temperature gradually increasing from 400° to 1600° and to endure for 30 minutes.

*Note.*—The area of protected door to be about 20 superficial feet and that of the window to be about 16 superficial feet.

*Note.*—The seat of the fire to be within three feet of the face of the fire blinds.

### SUMMARY OF EFFECT.

The blinds after 30 minutes' test remained in position, the fire not having come through the door or window.

### DESCRIPTION OF TESTING PLANT.

The Testing Chamber used was located at the Committee's Testing Station and was known as Hut No. 2.

The hut was constructed, as shewn, of stock bricks

with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the hut was 9 ft. 8 in. above the pavement of the chamber and was formed of solid wood beams grouted with fire-clay.

A brick wall, 14 in. thick, was built across the hut, running from east to west. It was built 13 ins. back from the main wall.

The wall was carried up to the ceiling, the height between floor and ceiling being 9 ft. 6 in. There were two openings in the wall, one for a window and one for a door, both 3 ft. 3 in. wide. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

The fuel used was gas produced at the station and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire brick, as shewn.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4, points 2 and 3 being outside the blinds and the others on the fire side of the blinds. A continuous record was also taken from point No. 5.

There were observation holes in the east and west walls, closed by moveable shutters.

The draught holes were in the east and west walls.

The photographs were partly taken by daylight and partly by flashlight.

## DESCRIPTION OF THE BLINDS.

(*See Figs.* A. *to* E.)

On May 21st, 1900, the blinds were put into position, the iron fittings shewn in Fig. E. being fixed into the walls, and the blinds attached to the blind rollers, and the latter suspended by stout blind cord.

The blinds were of the size shewn in Fig. E. The material of which the blinds were manufactured was stated to be asbestos cloth, supplied by the Cape Asbestos Company, and known as "E" brand.

Draught Holes

When the blinds were lowered the rollers at the bottom were held in position by the iron automatic catches shewn in Fig. E.

## THE TEST.

(*Figs.* 1 *to* 6.)

On May 23rd the Test was undertaken. The following is a log of the test:—

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regents Park, read as follows:—

State of weather, fair; Wind, S.W.; Barometer (no record); Attached thermometer (no record): Wet bulb, 52·5° Fahr.; Dry bulb, 57·5° Fahr.

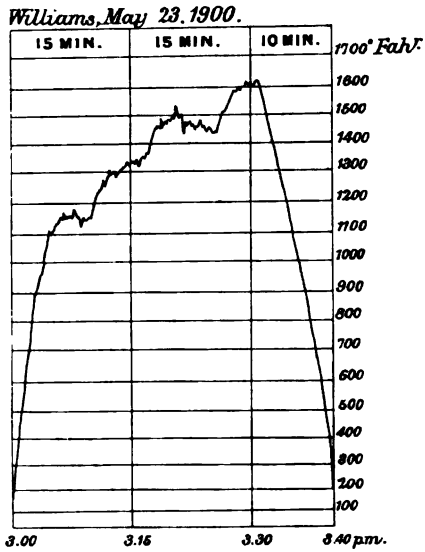
The following temperature observations were taken during the test from points Nos. 1 and 4 (inside the chamber), and Nos. 2 and 3 (outside the chamber).

OBSERVATIONS TAKEN AT POINTS NOS. 1, 2, 3, AND 4.

| TIME. | INSIDE. | | OUTSIDE. | |
|---|---|---|---|---|
| | Point No. 1 | Point No. 4 | Point No. 2 | Point No. 3 |
| | Fahr. | Fahr. | Fahr. | Fahr. |
| 3.3 p.m. | 730° | * | .. | ... |
| 3.6 ,, | 1050° | * | ... | ... |
| 3.9 ,, | 1100° | * | ... | ... |
| 3.12 ,, | 1260° | * | ... | ... |
| 3.15 ,, | 1320° | 1280° | ... | ... |
| 3.18 ,, | 1430° | 1410° | ... | ... |
| 3.21 ,, | 1490° | 1440° | ... | ... |
| 3.24 ,, | 1450° | 1400° | ... | ... |
| 3.27 ,, | 1515° | 1480° | ... | ... |
| 3.30 ,, | 1580° | 1520° | 100° | 100° |
| 3.33 ,, | 1250° | 1200° | 110° | 110° |

* These readings could not be taken owing to the junctions having been disturbed.

The following is a diagram showing the record taken from Point No. 5 by the continuous recorder.




At 2.55 p.m. the blinds were intact and rolled up.

At 3.0 p.m. the gas on the east side of the Hut, opposite the window, was lighted, the blind lowered and the window closed; immediately afterwards the gas on the west side was lighted, the west blind lowered and the door closed.

At 3.4 p.m. all the squares of glass in the door and window were cracked.

At 3.7 p.m. the cords by which the blinds had been lowered were burnt; all the glass was so hot that the hand could not be held upon it. Steam or vapour was coming from the joint between the head of the door and frame and also through the centre joint of the casement.

At 3.17 p.m. liquid of a brown colour was coming through some of the cracks in the glass on to the outside face. The thermometer hung on the outside, about 1 in.

from the surface of the glass, registered 180 degrees Fahr.

At 3.22 p.m. large quantities of vapour coming from the joints mentioned at 3.7 p.m.

At 3.23 p.m. flame observed inside the chamber from between the blinds and the window and door, greatest from the one covering the door (west side); this flame had about 3 ft. projection from the wall and appeared at intervals. The thermometer on outside registered 300 degrees Fahr.

At 3.30 p.m. the gas was turned off and the test concluded.

*Note.*—Up to this time no flame had passed through the door or window.

*Note.*—The photograph shewn in Fig. 8 was taken at 3.30 p.m.

## OBSERVATIONS AFTER THE TEST.

*See Figs. 9 to 13.*

Immediately after the test the following observations were made.

At the moment of turning off the gas, flame appeared all over the surface of the glass in the window and door, between it and the blinds, burning the surface of the door and window next the fire.

At 3.35 the window was opened and the flame on the inside face of the sashes and frame extinguished with water applied by a hand pump.

At 3.40 p.m. the door was opened and the flame on the inside face extinguished as last described.

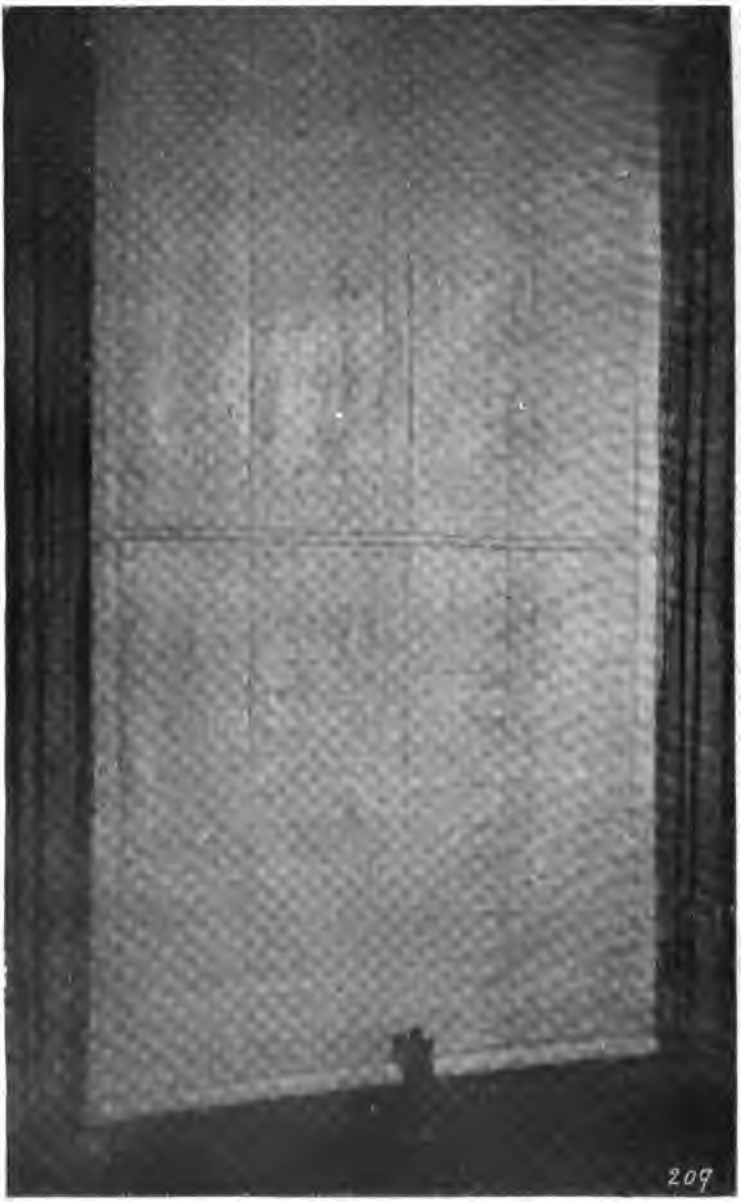
*Note.*—At 3.45 p.m. the photograph shewn in Fig. 13 was taken.

The sheet-glass in the upper part of the door and the plate-glass in the window was cracked and fractured very considerably, but no pieces had fallen out.

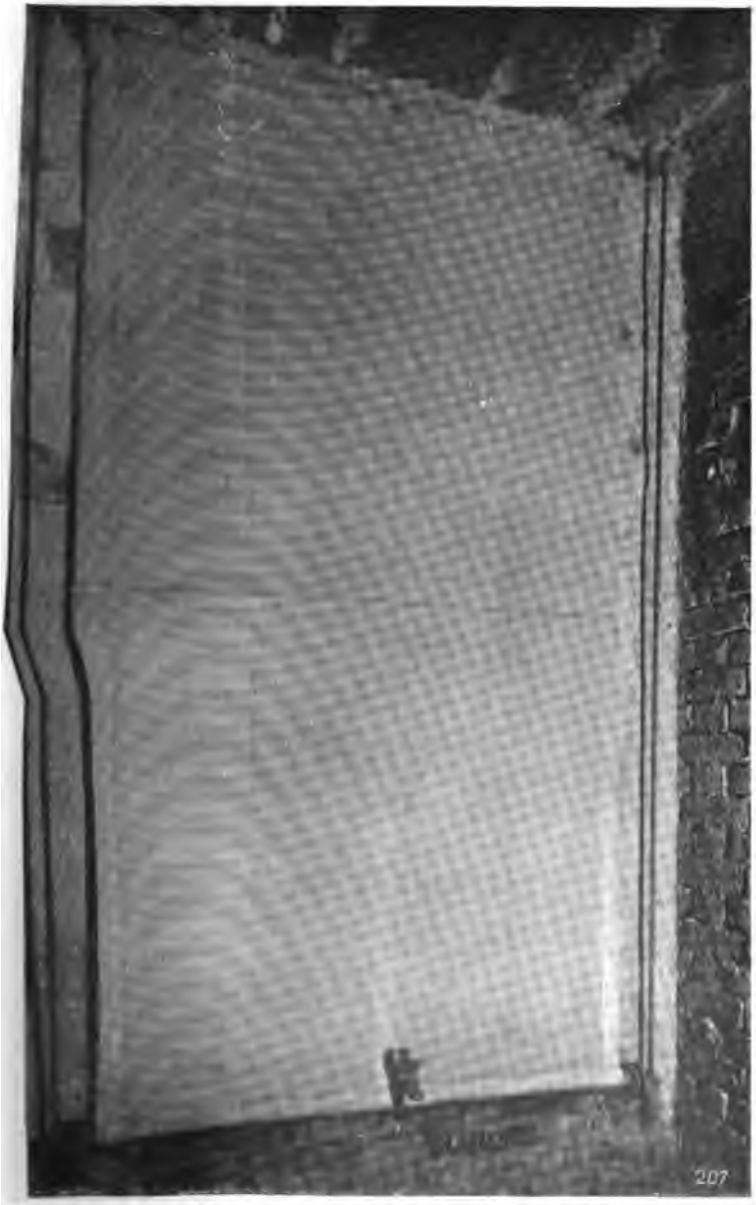
When the casement was opened it was seen that the inner part of the frame was burnt to an average depth

*Fig.* 7. VIEW OF WINDOW AND DOOR BEFORE TEST.

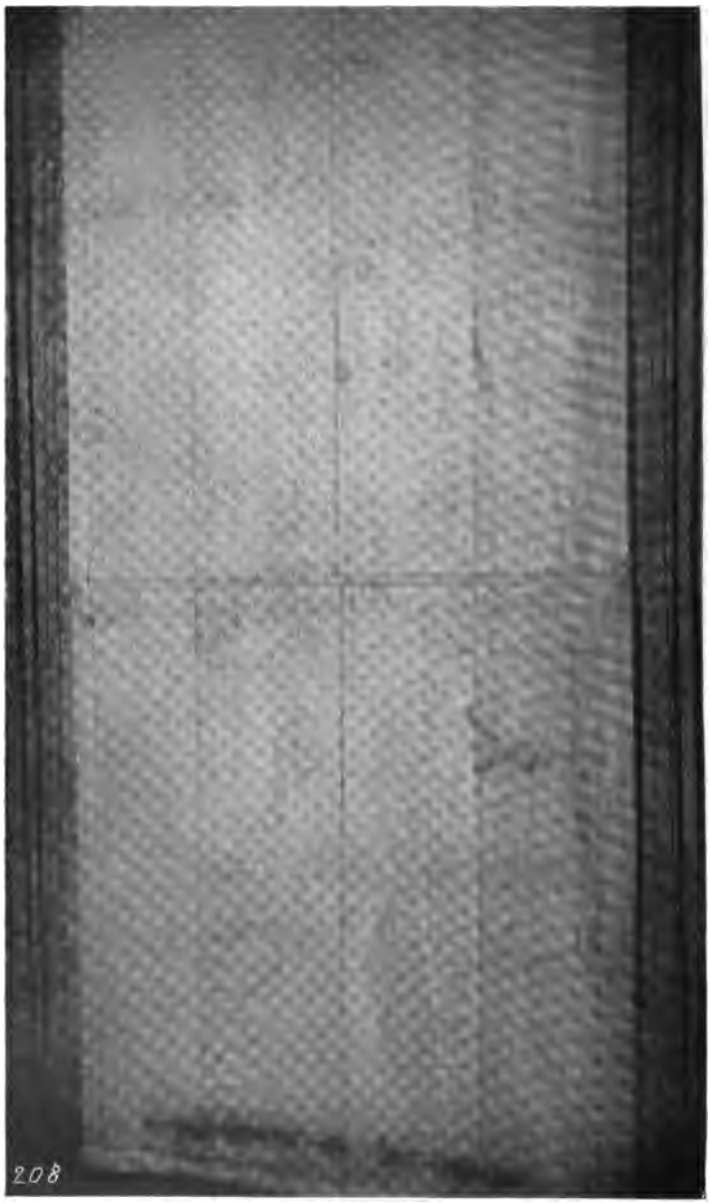
*Fig.* 8. View of Window and Door exactly at conclusion of Test.



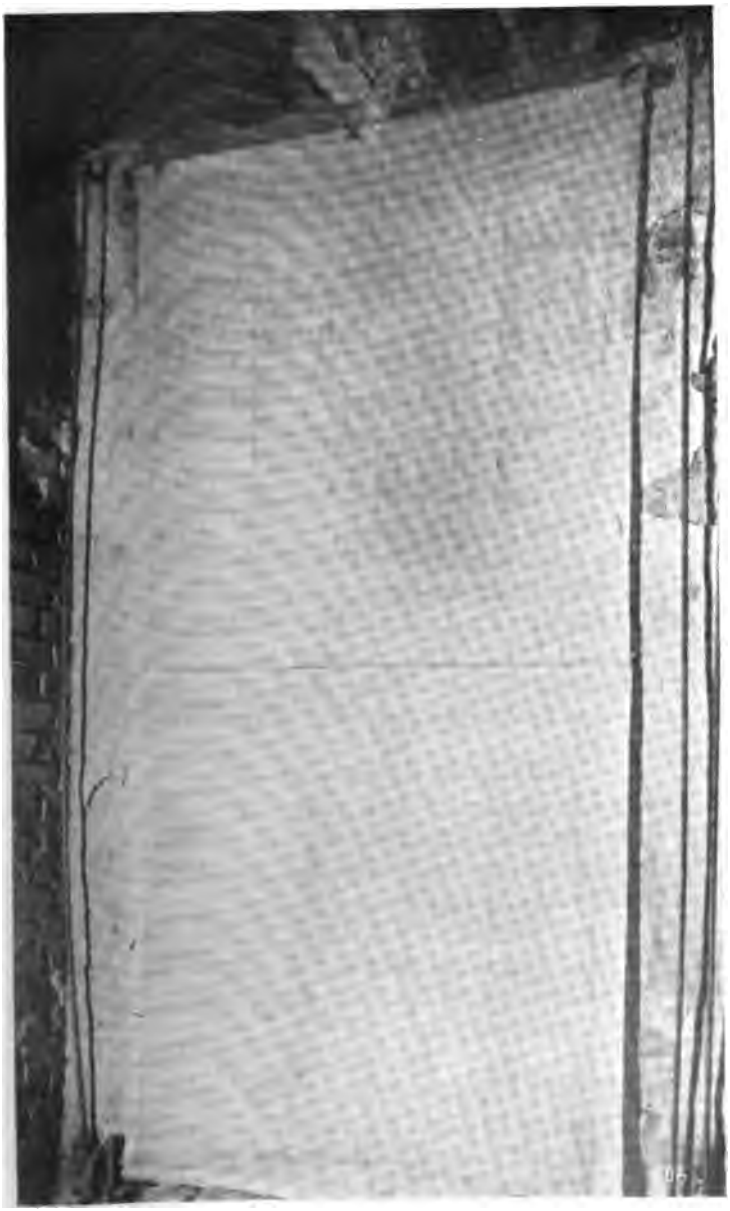

FIRE BLIND TO WINDOW. *Fig.* 9. VIEW BEFORE TEST (FROM FIRE SIDE).




FIRE BLIND TO WINDOW. *Fig.* 10. VIEW AFTER TEST (FROM FIRE SIDE).




FIRE BLIND TO DOOR. *Fig.* 11. VIEW BEFORE TEST (FROM FIRE SIDE).



FIRE BLIND TO DOOR. *Fig.* 12. VIEW AFTER TEST (FROM FIRE SIDE).

of ½ in., also the wood glazing bars and the casement generally to a similar depth. The outside of the casement was slightly blackened by smoke, but not burnt. The hinges and bolts were uninjured. The fire blind and fastenings were not damaged so far as appearances went, except for the burnt cords before mentioned.

The door, when opened, was found to be burnt all over the inner surface to a depth similar to the window, the sash bars and glazing fillets were burnt down to the glass face. Part of one square of glass fell out when the door was opened, and shortly after portions of two others fell out on the application of water. The outer face of the glazing bars next the glass were blackened, and over the top of the door the joint to frame was also blackened, but no sign of fire having come through, except at the west side, near head, in the joint between door and frame.

A hole, about 2 in. long by ¾ in. wide, was burnt through the door on the east side of the centre muntin half way up the east lower panel. The hinges, handle and bolts were uninjured. The fire blind and fastenings were not damaged so far as appearances went, except for the burnt cords before mentioned.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description and conducted by a Sub-Committee of the Executive, comprising:—

Mr. Max Clarke, A.R.I.B.A. (Directing Member).
Mr. Ellis Marsland (District Surveyor, Camberwell).
Mr. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.
Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by:

Mr. H. H. Collins, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division of City of London; Past President District Surveyors' Association.

The Executive was represented by:—

Mr. Edwin O. Sachs, F.S.S. (Chairman).
Mr. T. E. Gatehouse, F.R.S.Ed., A.M. Inst. C.E., M.I.M.E., M. Inst. E.E.
Mr. Chas. E. Goad, M.Am.Soc.C.E., M.Can.Soc.C.E.

The Commercial Section was represented by:—

Mr. Frederic R. Farrow, F.R.I.B.A.

The Members' Testing Sub-Committee was represented by:—

Mr. George E. Monckton, M.A.

The general body of Members was represented by:—

Mr. A. E. Bithrey.
Mr. William Cooper, M.S.A.
Mr. A. Creer, A.M. Inst. C.E., M.S.I., City Engineer and Surveyor, York.
Mr. A. Fearnhead.
Mr. J. Alfred Gotch, J.P., F.S.A., F.R.I.B.A.
Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington, St. Luke's, etc.
Mr. Joseph Randall, A.M. Inst. C.E., Past President Inst. of Builders.
Mr. Frank Sumner, A.M. Inst. C.E., Engineer and Surveyor to the Vestry of Bermondsey.
Mr. Thomas Wilkins, F.G.S.
Mr. Oswald C. Wylson, F.R.I.B.A.

Messrs. G. A. Williams & Son were represented by:—

Mr. Alfred Williams, Mr. G. A. Williams and Dr. G. J. Williams.

The following visitors attended by special invitation of the Executive:—

Mr. H. Chilton; Mr. A. J. Constable; Mr. C. Constable; Mr. Bernard Green; Mr. E. Jenner; Mr. J. A. Gill Knight, A.R.I.B.A.; Mr. W. H. Knight; Mr. H. Lewis; Mr. E. H. Runnacles; and Mr. E. J. Sadgrove.

Signed,

*For the Sub-Committee conducting the test*:
MAX CLARKE
(*Directing Member*).

*For the Commercial Section*:
FREDERIC R. FARROW.

*For the Executive*:
EDWIN O. SACHS
(*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

*Date—November* 10*th*, 1900.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & Co.
(*Solicitors*).

*Date—November* 15*th*, 1900.

)NS.

ɔ,

THE PARTITION. *Fig.* 8. VIEW OF INSIDE FACE AFTER TEST.

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 52.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH PARTITIONS.

## A PARTITION

FORMED WITH

## "MACK" PATENT SLABS,

AND ERECTED BY

MESSRS. J. A. KING & CO.,

LONDON.

## The Committee's Report.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
*(Founded 1897—Incorporated 1899),*
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superindending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS Three Casements glazed with Wired Glass by Messrs. Pilkington Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32-oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Maghogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete.

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*

EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington, Museum.
SIR DOUGLAS FOX, President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
THE RIGHT HON. THE EARL OF STRADBROKE.
ALEXANDER STENNING, F.R.I.B.A.
SIR ARTHUR SULLIVAN, Mus. Doc.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
MATT. GARBUTT, A.M.Inst C.E., A.R.I.B.A.
T. E. GATEHOUSE, F.R.S.Ed., A.M.Inst.C.E.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C.E., M.I.Mech.E., Past President, Municipal Electrical Association.

*Chairman of the Commercial Section:*

FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors*

WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*

JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*

LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*

T. KISSACK.

*Hon. Secretary:*

GEORGE E. MONCKTON M.A.

*Offices:*

1, WATERLOO PLACE, PALL MALL, LONDON. S.W.

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

The question of rapidly forming light fire-resisting partitions is one that is constantly before architects, and the report here presented should be a valuable contribution towards the records on this subject.

As time is such a matter of importance, special attention should, perhaps, be called to the fact that the time allowed for the construction and drying of this partition was to be three weeks, and that, as a matter of fact, the construction of the partition was commenced on May 1st and the test actually took place on May 23rd.

EDWIN O. SACHS.

LONDON,
*July 15th*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

(*MEMORANDUM.*)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, ***Chairman.***

OFFICIAL REPORTS

OF THE

# British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

FIRE TEST NO. 21.—MAY 23RD, 1900.

## A PARTITION

FORMED WITH

"MACK" PATENT SLABS,

AND ERECTED BY

MESSRS. J. A. KING & CO.,

LONDON.

### OBJECT OF TEST.

To record the effect of a fire of one hour and a quarter duration, commencing at 500° Fahr. and increasing to 2,000° Fahr., followed by the application of water for two minutes on the fire side.

*Note.*—The area of the partition under investigation was to be at least 75 ft. superficial, with a width of 10 ft.

*Note.*—The time allowed for the construction and drying of the partition was to be three weeks (spring).

### SUMMARY OF EFFECT.

The setting coat on the fire side of the partition fell during the application of heat.

A portion of the rendering on the fire side fell on the application of water.

The fire did not pass through the partition.

No effects of the fire were apparent on the passage side of the partition, except two blisters and some hair cracks following the courses of the joints.

The temperature of the outside face of the partition at no time exceeded 125° Fahr.

The plastering in the inner face of the partition was cracked and disintegrated.

On examination after the test, the face of the slabs next the fire was disintegrated to a depth of about $\frac{3}{4}$ of an inch, the remainder of the slabs being unaffected.

## DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as "No. 5 Hut."

The hut was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling was 7 ft. 7½ in. above the pavement of the hut, and was constructed of wood beams.

The hut was covered in with a tarpaulin.

The door, opening in the north wall, measured 2 ft. by 6 ft. 6 in., and was open during the test.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The hut was divided as shown on plan, the partition being constructed from east to west, the full width and height of the hut, leaving the passage on the outside 2 ft. wide.

The gas was admitted through two mixing chambers of fire-brick, each 7 ft. 9 in. by 3 ft. 6 in., as shown.

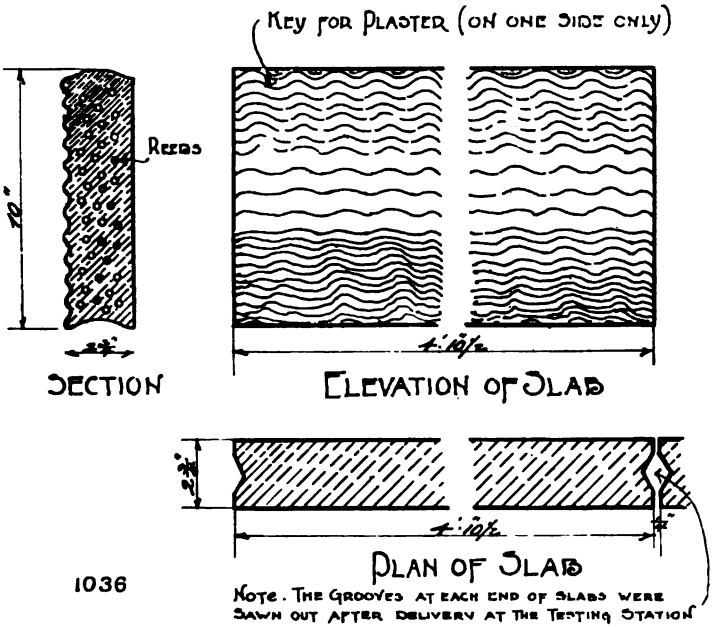
Two Roberts-Austen pyrometers were used for recording temperatures, one taking a continuous record from point No. 5, and one being used for the observation records at points Nos. 1, 2, 3, 4. Points Nos. 1, 4, 5 were inside the chamber, and Nos. 2 and 3 outside in the passage.

Therm.

Pl.

There were two observation holes, one in the east and one in the west walls, and two small observation holes in the south wall.

The stream of water was applied to the inside face of partition, through the observation hole on the west side, by a branch with $\frac{1}{2}$ in. nozzle, and supplied from a manual fire engine similarly equipped.




The Partition. *Fig.* 5. Details of Slabs.

## CONSTRUCTION OF THE PARTITION.

*See Figs. Nos.* 1 *to* 5.

Plans, elevations and sections of the partition are shown.

The construction of the partition was as follows :—

On April 26th the material was delivered at the Testing Station.

On May 1st the east and west walls where the partition abutted against them had a coat of plaster 10 in. wide and 1 in. thick.

Two plaster slabs, each 10 in. wide and 1 in. thick, were nailed to the ceiling immediately over the partition with $2\frac{3}{4}$ in. galvanised iron nails.

On May 1st, 2nd and 3rd the partition was erected. A course of stock bricks was laid on the floor of the hut, and the slabs forming the partition were built on these and carried up to the underside of ceiling-slabs, a height of 7 ft. 5 in. The partition was composed of slabs, each 10 in. in height and $2\frac{3}{8}$ in. thick, and of lengths varying from 1 ft. 6 in. to 4 ft. $10\frac{1}{2}$ in.

The slabs, according to the maker, were made of plaster, with cocoanut fibre, cork dust and reeds embedded therein and running horizontally along the whole length of same. There were from 30 to 40 reeds in each slab. The slabs were delivered at the Testing Station with square ends. The ends were afterwards sawn out to form the vertical V joints.

The slabs were set with mortar mixed in the proportion of two parts of plaster of Paris, one part of lime, and two parts of sand. The vertical joints were grouted in with the same material.

The inside face of each slab was keyed for plaster.

The outside face, being smooth, was afterwards scratched or "devilled" to form a key.

On May 3rd and 4th the inside of partition was plastered one coat of coarse stuff, composed of plaster of Paris and sand in equal proportions.

On May 15th the second or finishing coat was put on (inside face of partition). This was made with plaster, sand and lime in the proportion of one part of plaster of Paris, two parts of sand, and one part of lime.

On May 4th the outside of partition was plastered one coat with lime putty, and plaster of Paris in equal proportions, mixed with water, to which a small proportion of sugar was added.

The plaster on the inside of partition was 1 in. thick, that on the outside was ½ in. thick.

On May 8th a horizontal crack was observed on the outside of partition, 5 ft. 6 in. from the floor and running half-way across the partition on the west side. The plaster around this was cut away, and on the 15th May was made good with plaster of Paris.

There was a plaster fillet around the angles of partition and at floor, covering the course of stock bricks upon which the partition was built.

The weather report on May 1, 2, 3, 4 and 15, when the partition was being erected, was as follows :—

May 1st, very fine; highest in air 59·8° Fahr.

May 2nd, very fine; highest in air 64° Fahr.

May 3rd, fine, strong wind; highest in air 56·2 Fahr.

May 4th, fine, mild; highest in air 61° Fahr.

May 15th, strong cold wind; highest in air 57·5 Fahr.

## PREPARATIONS FOR THE TEST.

On May 19th coke fires (two on each side of partition) were lighted and kept in continuously until May 23rd, noon.

## THE TEST.

On May 23rd the test was undertaken. The following is a log of the test :—

At 3 p.m. the meteorological observations, taken at the Botanic Gardens, Regent's Park, read as follows :—

"State of weather, fair; Wind, S.W.; Barometer, not taken; Attached Thermometer, not taken; Wet Bulb, 52·5° Fahr.; Dry Bulb, 57·5° Fahr; Remarks: Unsettled, showery, changeable afternoon."

At 3.30 p.m. the gas was lighted.

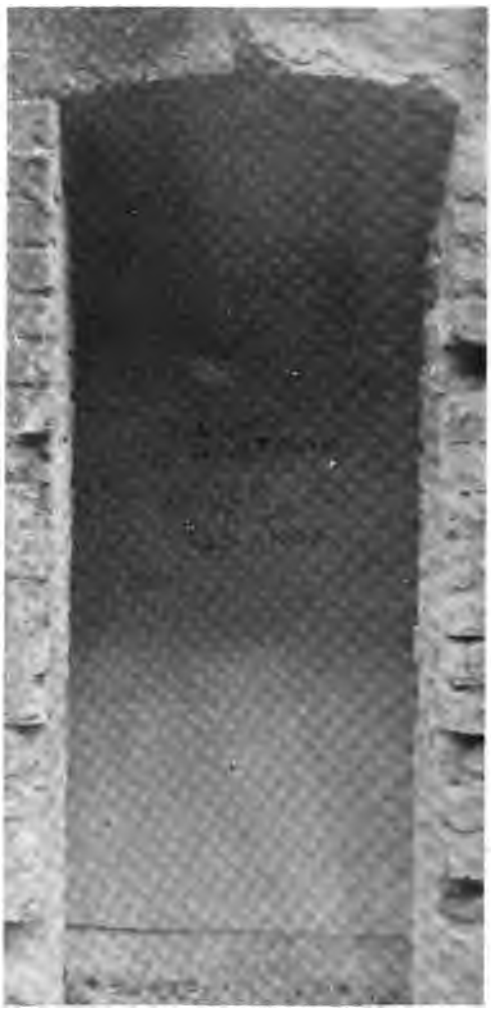
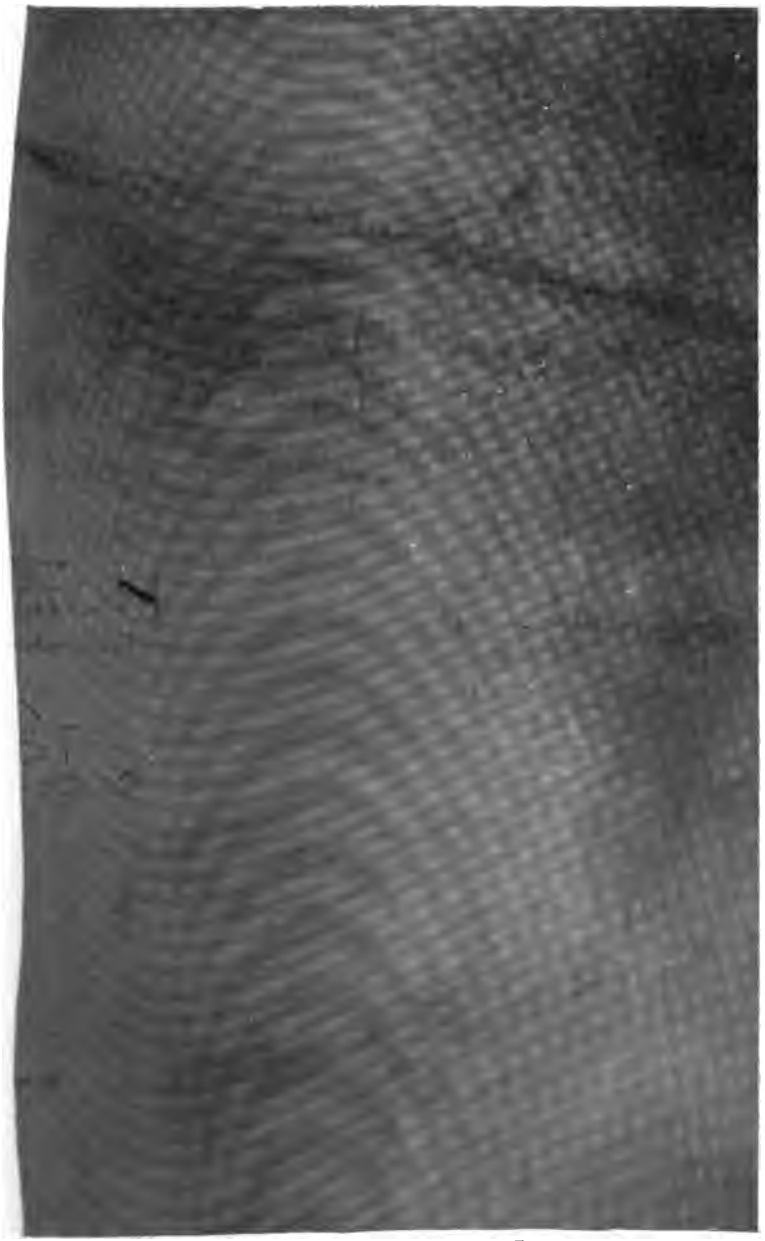


*Fig.* 6. THE PARTITION. VIEW THROUGH DOOR OF HUT OUTSIDE PARTITION AFTER TEST.



THE PARTITION. *Fig.* 7. VIEW SHOWING PART OF PARTITION AFTER TEST (AS SEEN FROM OUTSIDE).

At 3.32 p.m. the setting coat of plaster on the fire side of partition commenced to blow off.

At 3.34 p.m. the setting coat had all blown off.

At 3.35 p.m. fine hair cracks, following the horizontal joints of the slabs, began to appear on the passage side of partition.

At 3.41 p.m. steam began to issue at various points from these joints.

At 3.44 p.m. fine hair cracks following the vertical joints of slabs began to appear on the passage side of partition.

At 4.11 p.m. the fine hair cracks in the vertical joints almost closed up.

At 4.15 p.m. the setting coat of plaster on the passage side of partition showed two blisters about the centre, one at the level of the 5th joint and the other at the level of the 7th joint.

The following temperatures were taken on the passage side of the partition by the aid of a thermometer hung against the partition, but the bulb not touching the face of the plaster :—

| | | | |
|---|---|---|---|
| 3.51 p.m. | ... | 100° | Fahr. |
| 4.5 „ | ... | 110° | „ |
| 4.17 „ | ... | 125° | „ |
| 4.45 „ | ... | 125° | „ |

At 4.45 p.m. the gas was turned off.

The fire had not passed through the partition, and the surface on the passage side, except for the hair-cracks and two blisters before mentioned, was unaffected by the fire.

At 4.46 water was turned on to the inside face of the partition for two minutes, at 20 lbs. pressure.

The effect of this was to wash off some of the rendering where struck by the water, but no other effect was apparent.

The temperatures, as read from the observation record off pyrometer points, Nos. 1, 2, 3 and 4, were as follows:

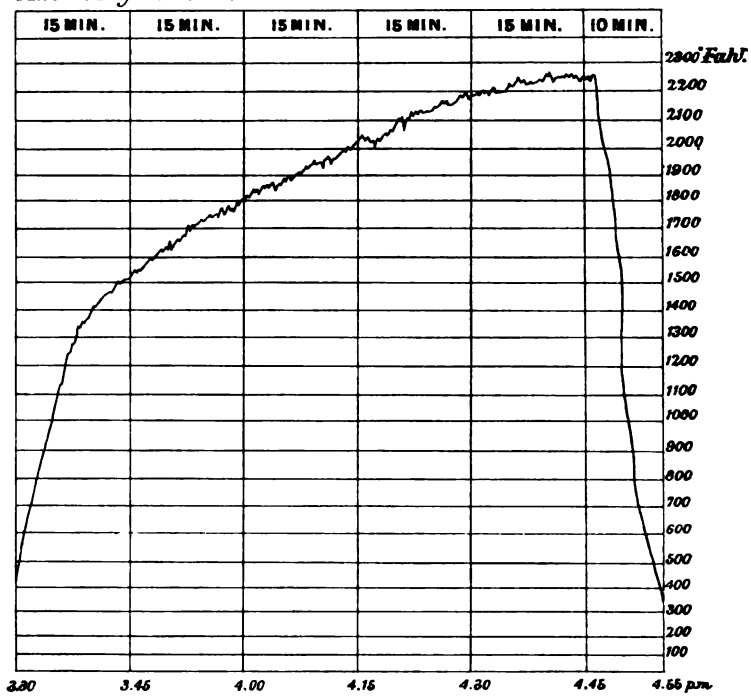
OBSERVATIONS TAKEN FROM POINTS NOS. 1, 2, 3, 4.

*From* 3.35 *p.m. to* 4.45 *p.m.*

| | Inside. | | Outside (in passage). | |
|---|---|---|---|---|
| Time. | No. 1. Fahr. | No. 4. Fahr. | No. 2. | No. 3. Fahr. |
| 3.35 p.m. | 1,000° | 1,050° | — | — |
| 3.40 „ | 1,350° | 1,300° | — | — |
| 3.45 „ | 1,450° | 1,410° | — | — |
| 3.50 „ | 1,550° | 1,450° | — | — |
| 3.55 „ | 1,600° | 1,600° | — | — |
| 4.0 „ | 1,600° | 1,660° | — | 100° |
| 4.5 „ | 1,680° | 1,720° | — | 105° |
| 4.10 „ | 1,720° | 1,760° | — | 100° |
| 4.15 „ | 1,780° | 1,860° | — | 105° |
| 4.20 „ | 1,840° | 1,940° | — | 95° |
| 4.25 „ | 1,900° | 1,980° | — | 90° |
| 4.30 „ | 1,920° | 2,000° | — | — |
| 4.35 „ | 1,900° | 2,050° | — | — |
| 4.40 „ | 1,980° | 2,050° | — | — |
| 4.45 „ | 1,960° | 2,040° | — | — |

The temperature, as shown by the automatic record point 5 (inside), was as follows :—

*Mack. May 23. 1900.*




## OBSERVATIONS AFTER TEST.

(*Figs.* 6, 7, *and* 8.)

On May 24th the following observations were made :—

The face of the partition on the passage side had undergone no change since the conclusion of the test.

The whole of the setting coat on the inside had fallen.

Part of the rendering where struck by the water was washed away.

The plastering generally was disintegrated and showed cracks in line with the horizontal joints of slabs.

A piece of the plaster about 8 in. in diameter, 2 ft. from west wall and 3 ft. from floor, was detached, leaving

the face of one of the slabs, forming the partition, exposed *(see Fig. 8)*.

The inside row of reeds embedded in the slabs forming the partition was charred, and the surface of the slabs on the fire side for about $\frac{3}{4}$ of an inch was disintegrated.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description and conducted by a Sub-Committee of the Executive, comprising:—

Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.
Mr. T. E. Gatehouse, F.R.S.Ed., A.M. Inst. C.E., M.I.M.E., M. Inst. E.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., Superintendent in the Instrument Room.

The Council was represented by:—
Mr. H. H. Collins, F.R.I.B.A, F.S.I., District Surveyor, Eastern Division of City of London.

The Executive was represented by:—
Mr. Edwin O. Sachs, F.S.S. (Chairman).
Mr. Max Clarke, A.R.I.B.A.
Mr. Chas. E. Goad, M.Am.Soc.C.E., M.Can.Soc.C.E.

The Commercial Section was represented by:—
Mr. Frederic R. Farrow, F.R.I.B.A.

The Members' Testing Sub-Committee was represented by:—
Mr. George E. Monckton, M.A.

The general body of members was represented by:—
Mr. A. E. Bithrey.
Mr. William Cooper, M.S.A.
Mr. A. Creer, A.M.I.C.E., M.S.I., City Engineer and Surveyor, York.

Mr. A Fearnhead.
Mr. J. Alfred Gotch, J.P., F.S.A., F.R.I.B.A.
Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington, St. Luke's, &c.
Mr. Joseph Randall, A.M.Inst.C.E., Past Pres. Inst. of Builders.
Mr. Frank Sumner, A.M.Inst.C.E., Engineer and Surveyor to the Vestry of Bermondsey.
Mr. Thomas Wilkins, F.G.S.
Mr. Oswald C. Wylson, F.R.I.B.A.

Messrs. J. A. King & Co. were represented by :—
Messrs. J. A King, J. King, E. C. Browne, A. E. Faulkner, and O. Mack.

The following visitors attended by special invitation of the Executive :—
Messrs. H. Chilton, A. J. Constable, C. Constable, Bernard Green, Edward Jenner, J. A. Gill Knight, A.R.I.B.A., W. H. Knight, H. Lewis, E. H. Runnacles, E. J. Sadgrove, and Geo. H. Trollope.

Signed,

*For the Sub-Committee conducting the Test:*
ELLIS MARSLAND (*Directing Member*).

*For the Commercial Section:*
FREDERIC R. FARROW.

*For the Executive:*
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.
H. S. TAYLOR
(*Assist. Secretary*).
*Date—August 15th.*

Verified a true copy of the Report, ordered to be published.
WILLIAMSON, HILL & Co.
(*Solicitors*).
*Date—September 15th.*

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No.* 53.

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH PARTITIONS.

## A PARTITION

KNOWN AS

## THE "CUNNAH-WRIGHT" PARTITION

ERECTED BY

## THE FIREPROOF PARTITION SYNDICATE, LTD.,

LONDON.

## The Committee's Report.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF

THE BRITISH FIRE PREVENTION COMMITTEE

*(Founded 1897—Incorporated 1899),*

1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superindending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS Three Casements glazed with Wired Glass by Messrs. Pilkington Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32-oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Maghogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete.

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past President, Royal Institute of British Architects.

SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.

PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.

SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.

THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect, London County Council; Member of Council, Royal Institute of British Architects.

ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.

H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division, City of London; Past Pres., District Surveyors' Association.

SIR W. MARTIN CONWAY, M.A., F.S.A.

ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.

PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.

MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.

SIR DOUGLAS FOX, President, Institution Civil Engineers.

H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.

SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.

W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.

SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.

SIR NORMAN LOCKYER, C.B., F.R.S.

A. B. MACDONALD M.Inst.C.E., City Engineer, Glasgow.

SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.

JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.

W. E. RILEY, The Architect, London County Council.

ALEXANDER SIEMENS, M.Inst.C.E. Past President, Institute of Electrical Engineers.

THE RIGHT HON. THE EARL OF STRADBROKE.

ALEXANDER STENNING, F.R.I.B.A.

SIR ARTHUR SULLIVAN, Mus. Doc.

SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.

LIEUT-COL. W. E. M. TOMLINSON, M.P.

W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.

HERBERT BEERBOHM TREE, Her Majesty's Theatre.

ROBERT VIGERS, Past President, The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
MATT. GARBUTT, A.M.Inst.C.E., A.R.I.B.A
T. E. GATEHOUSE, F.R.S.Ed., A.M.Inst.C.E.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc. C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Archt., F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C.E., M.I.Mech.E., Past President, Municipal Electrical Association.

*The Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*
LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*
T. KISSACK.

*Hon. Secretary:*
GEORGE E. MONCKTON, M.A.

*Offices:*
1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE.*

The main objects of the Committee are:—

To direct attention to the urgent need for increased portection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

The question of rapidly forming light fire-resisting partitions is one that is constantly before architects, and the Report here presented should be a valuable contribution towards the records on the subject.

As time is such a matter of importance, special attention is called to the fact that the time allowed for the construction and drying of this partition was four weeks. The construction of the partition was actually commenced on March 9th, and the test took place on April 11th.

In connection with the issue of this Report, it may be of interest to know that the maker has applied for a further test with a partition, which he proposes to give a longer time for construction and drying; the extent of the test, however, to be limited to one hour instead of one hour and a quarter, as in the present case.

EDWIN O. SACHS.

LONDON,
*June 15th*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORTS

OF THE

# British Fire Prevention Committee.

[FOUNDED, 1897.—INCORPORATED, 1899.]

## FIRE TEST No. 22.—11TH APRIL, 1900.

## A PARTITION

KNOWN AS

## THE "CUNNAH-WRIGHT" PARTITION

ERECTED BY

## THE FIREPROOF PARTITION SYNDICATE, LTD., LONDON.

### OBJECT OF TEST.

To record the effect of a fire of one hour and fifteen minutes' duration, commencing at about 500° Fahr. and increasing to 2,000° Fahr., followed by the application of water for two minutes on the fire side.

*Note.*—The area of the partition under investigation was to be about 80 ft. superficial, with a width of 10 ft.

*Note.*—The time allowed for the construction and drying of the partition was to be four weeks (winter).

### SUMMARY OF EFFECT.

Hair cracks, from which the steam escaped, appeared from time to time on the passage side of the partition.

The temperature of the outside face of the partition during the latter part of the test was too hot to bear the hand, and paper held against it was scorched.

The fire did not pass through the partition during the one hour and fourteen minutes it was applied.

During the application of water to the fire side of the partition it fell inwards bodily.

*Note.*—The bulging of the iron studs as they became heated allowed the head of the partition to drop slightly and so made a slight space over it. Flame then spread over the top of the partition by means of the wood beams forming the ceiling to the hut, these beams being so laid as to cover both the chamber and the passage. This increased the temperature on the outside of the partition (in passage).

*Note.*—See the diagram, Fig. 7, for the progress and extent of the bulging referred to.

## DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as "No. 1 Hut."

The hut was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling was 8 ft. above the pavement of the hut.

The hut was covered with a tarpaulin.

The door-opening in the south wall measured 2 ft. 6 in. by 6 ft. 6 in.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The hut was divided as shown on plan, the partition being constructed from east to west, the full width and height of the hut, leaving a passage on the outside 2 ft. 3 in. wide. The size of the chamber was 7 ft. 7 in. by 10 ft.

The gas was admitted through two mixing chambers of fire brick, each 7 ft. 3 in. by 3 ft. 6 in., as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, one taking a continuous record from point No. 5, and one being used for the observation record at points Nos. 1, 2, 3, 4; points Nos. 1, 2, 5 were in the chamber, and Nos. 3 and 4 outside in the passage.

There were two observation holes, one in the east and

1029

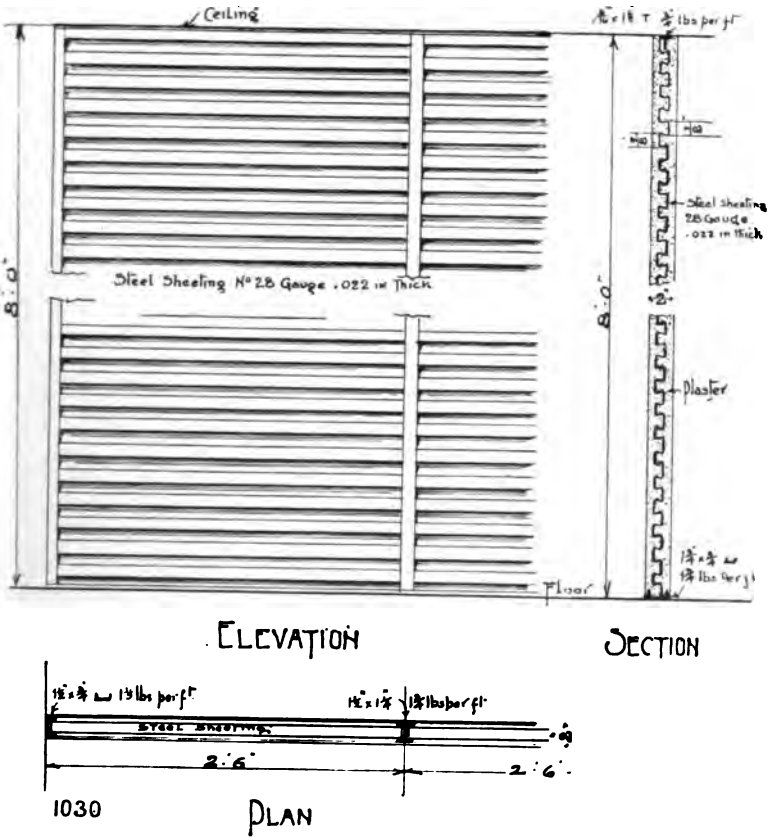



*Fig.* 5. DETAILS OF THE PARTITION.

one in the west wall, and two small observation holes in the north wall.

The stream of water was applied to the fire side of partition through the east observation hole by a branch with a $\frac{1}{2}$-in. nozzle, supplied from a manual fire engine.

## CONSTRUCTION OF THE PARTITION.

(*See Figs. Nos.* 1 *to* 5.)

Plans, elevations and sections of the partition are shown.

The construction of the partition was as follows :—

On March 9th, 1900, the frame-work of the partition was erected. It was set back from the south wall of hut 2 ft. 3 in. ; it ran east and west and was 10 ft. wide and 8 ft. high from floor to ceiling.

A $1\frac{3}{4}$ in. by $\frac{3}{4}$ in. channel iron, $1\frac{3}{4}$ lbs. per ft., was laid on the floor, and a $1\frac{3}{16}$ in. by $1\frac{1}{8}$ in. T-iron, $\frac{3}{4}$ lb. per ft., was secured to the wooden ceiling with iron hold-fasts 2 in. long. Against each wall was a channel iron $1\frac{1}{2}$ in. by $\frac{3}{4}$ in., $1\frac{1}{5}$ lb. per ft., secured with 2 in. iron hold-fasts, and $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. H-irons, $1\frac{3}{4}$ lbs. per ft., were used as uprights (or studs), spaced 2 ft. 6 in. centre to centre. The feet rested in the floor channel, and the heads were secured to the T-iron at the ceiling by cutting a narrow notch out of the vertical H-irons and letting the T-iron fit therein.

Some No. 0·28 gauge, ·022 in. thick steel sheeting, described by the maker as No. 0·28 gauge, ·022 in. thick, was used as lathing between the uprights (or studs), and went from floor to ceiling. This sheeting had $\frac{7}{8}$ in. by $\frac{7}{8}$ in. dovetailed corrugations, so as to form a key for plaster.

On March 10th and 12th the first and second coats of coarse stuff were put on. The material was brought on to the ground ready made. The contractor who supplied it stated that it had been made three weeks, and was in the proportion of 1 yard of grey lime, 3 yards of coarse sand, and 14 lbs. of hair. An additional 14 lbs. of

hair was added on arrival at the station. Plaster of Paris was also added in the proportion of 1 bushel of plaster of Paris to 1 yard of coarse stuff.

On March 13th a coke fire was lighted on each side of the partition, and this was repeated daily until March 16th.

On March 17th the finishing coat was put on. This was made of three parts of well-seasoned lime putty, one part of washed sand, and slightly gauged with plaster of Paris. The total thickness of partition when finished was 2 in.

On March 29th, and every day until April 3rd inclusive, a coke fire was lighted in the hut on the inside of partition.

On April 2nd some small cracks which had appeared on the outside of partition were made good with plaster.

The weather report for March reads as follows:—

Rainfall for the month (taken at Camden Square) was ·79 inches, with a maximum of ·41 in. on March 18th. The maximum temperature was 58·6 Fahr. (March 12th), and the minimum 23·4 Fahr. (March 18th).

## PREPARATIONS FOR THE TEST.

The tarpaulin over the hut was removed prior to the commencement of the test.

## THE TEST.

(*See Fig.* 6.)

On April 11th, the Test was undertaken.

The following is the log of the Test:—

At 3 p.m. the meteorological observations, taken at the Botanic Gardens, Regent's Park, read as follows:—

State of Weather, fair; Wind, west south west; Barometer, 29·52 in.; Attached Thermometer, 53° Fahr.; Wet Bulb, 48° Fahr.; Dry Bulb, 54° Fahr. Remarks: Fine afternoon.

*Observations from the outer (Southern) side.*

At 2.45 p.m., immediately before the test began, a fine vertical crack was observed at the centre upright or

stud on the outside face, running from top to bottom of the partition. A similar, but even finer, vertical crack was observed at the east stud, and a horizontal one at 4 ft. 3 in. above the bottom extended from the east to the west stud.

At 2.51 p.m. the gas was lighted.

At 2.57 p.m. the crack over the middle stud opened slightly.

At 2.59 p.m. steam in small quantities issued from the vertical crack at middle stud, and from the horizontal crack at about 4 ft. 3 in. from bottom.

At 3.2 p.m. thermometer hung on face of partition stood at 80°.

*Note.*—This was a glass tube thermometer hung to a pin driven into the face of partition. The bulb was not in close contact with the face, and the wind played freely upon it.

At 3.2 p.m. crepitations heard. A number of horizontal hair cracks appeared on the upper part of the outside face of the partition. A quantity of steam was coming off from the whole surface of partition, the greater part through these cracks.

At 3.4 p.m. thermometer on face 104° Fahr. The face generally was just too hot to bear the hand upon, and hottest over the studs.

At 3.12 p.m. a crack over east stud opened nearly $\frac{1}{16}$ in. at the top.

At 3.15 p.m. considerable crepitation audible, thermometer on face 134° Fahr. A crack was formed between wall and partition at west end $\frac{1}{16}$ in. wide.

At 3.20 p.m. thermometer on face 131° Fahr. The crack over centre stud $\frac{1}{16}$ in. open.

At 3.22 p.m. a little smoke escaping over top of partition.

At 3.28 p.m. surface over the studs discoloured by heat.

At 3.29 p.m. thermometer on face 160° Fahr.

At 3.32 p.m. crack on east stud was open for a length of 12 in. from top, $\frac{1}{10}$ in wide. Crack between partition and west wall open $\frac{1}{8}$ in.

At 3.35 p.m. thermometer on face 170° Fahr.

At 3.40 p.m. blister forming over west stud 3 ft. from floor.

At 3.42 p.m. flames appearing in small jets over top of partition in east angle.

*Note.*—The bulging of the iron studs as they became heated allowed the head of the partition to drop slightly and so made a slight space over it. Flame then spread over the top of the partition by means of the wood beams forming the ceiling to the hut, these beams being so laid as to cover both the chamber and the passage. This increased the temperature on the outside of the partition (in passage).

At 3.43 p.m. thermometer on face 196° Fahr.

The face of the partition, for a length of 4 ft. at the centre, lifted from floor $\frac{1}{10}$ of an inch.

At 3.46 p.m. flame coming over top of partition for a length of 1 ft. from the east wall; no other flame visible. Thermometer on face 190° Fahr. All cracks opening.

At 3.48 p.m. considerable amount of smoke issuing all along top of partition, and flame for a length of 2 ft. 6 in. from east end. Thermometer on face 210° Fahr.

At 3.51 p.m. a large blister, 2 ft. by 12 in. wide, formed on west stud about 1 ft. 6 in. above floor.

At 3.54 p.m. smoke issued from horizontal cracks near centre.

At 4 p.m. paper held against surface was scorched.

At 4.3 p.m. the partition commenced to incline bodily inwards.

At 4.5 p.m. flame was coming over top of partition along its whole length.

At 4.5 p.m. the gas was turned off.

At 4.6 p.m. water was applied to the inside face through east observation hole.

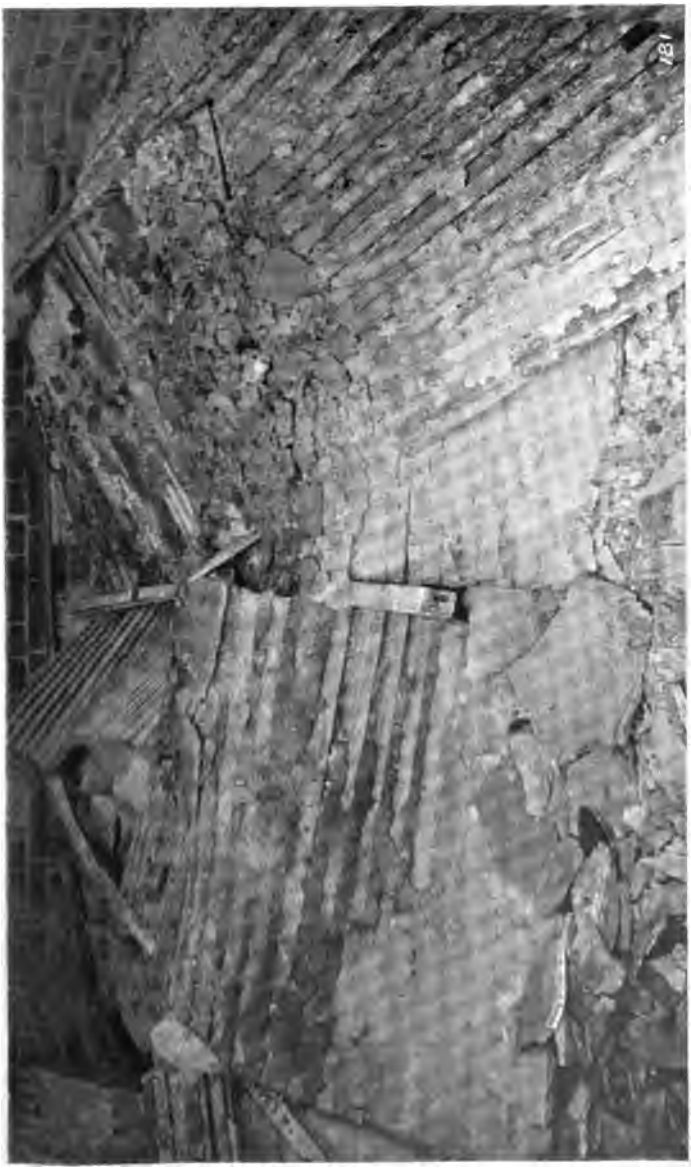


*Fig.* 6. View Showing The Partition after Test

The plaster on inside face immediately commenced falling, and, as soon as the fall of the interior plaster became general, the water penetrated alongside the

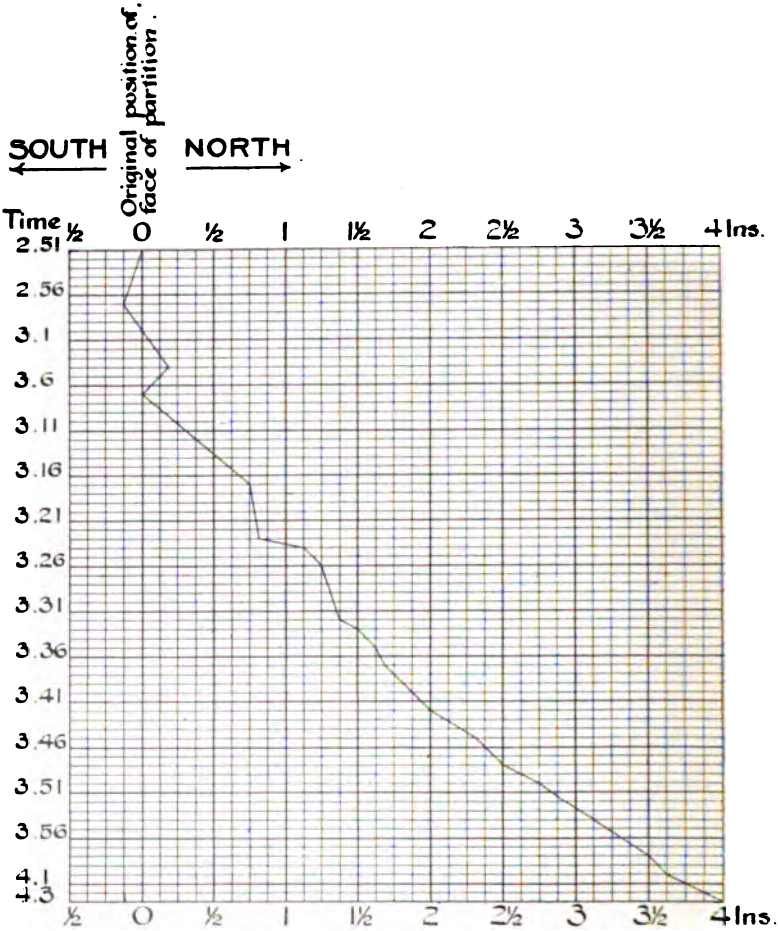



DIAGRAM SHEWING THE EXTENT TO WHICH THE PARTITION BULGED DURING THE PROGRESS OF THE TEST. ALL THE MEASUREMENTS WERE TAKEN AT A SPOT 4 FT. 7 INS. FROM THE BOTTOM OF THE PARTITION AND 1 FT. 4 INS WEST OF ITS CENTRE.
No. 1039.

*Fig.* 7.

studs, and a great deal of the exterior plaster dropped off, the top part going first.

At 4.9 p.m. the whole partition fell bodily inwards.

The water was turned off, and the Test concluded.

*Observations from the fire (Northern) side.*

At 3.3 p.m. horizontal cracks, two about 6 in. apart on east bay, about the centre of height, were observed.

At 3.10 p.m. the plaster over west stud was seen to be bulging towards fire.

At 3.12 p.m. plaster bulging off central stud for a distance of 3 ft., commencing about 2 ft. above floor. A small portion of plaster had fallen out of crack for a distance of 2 ft. above floor. An area of 9 in. by 9 in. was blowing off east of central stud, and was projecting about 4 in.

At 3.15 p.m. plaster referred to at 3.12 p.m. had fallen off face of stud.

At 3.21 p.m. an area, about 6 in. diameter, blowing off about 3 ft. from floor, and on west side.

At 3.24 p.m. plaster blowing off east stud, about 4 ft. 6 in. from floor on inside face.

At 3.30 p.m. plaster had almost entirely fallen off central stud.

*Note.*—The diagram, Fig. 7, shows the progress and extent of the bulging that occurred in the partition during the Test.

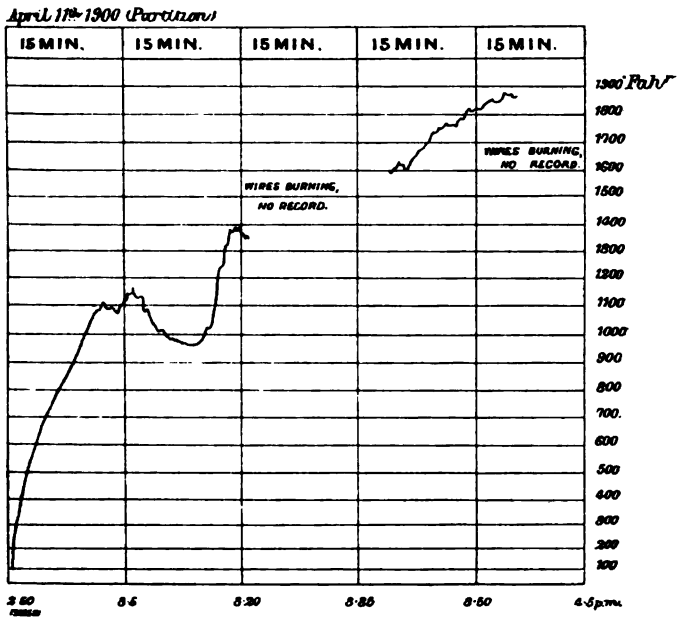
The temperatures as read from the observation record off pyrometer points, Nos. 1, 2, 3, 4, were as follows:—

OBSERVATIONS TAKEN FROM POINTS NOS. 1, 2, 3 AND 4.

| | INSIDE. | | OUTSIDE (IN PASSAGE). | |
|---|---|---|---|---|
| TIME. | No. 1. Fahr. | No. 2. Fahr. | No. 3. Fahr. | No. 4. Fahr. |
| 2.55 p.m. | 650° | 700° | — | — |
| 3.0 „ | 1,080° | 1,040° | — | — |
| 3.5 „ | 1,140° | 1,090° | — | — |
| 3.10 „ | 1,080° | 920° | — | — |
| 3.15 „ | 1,180° | 1,050° | — | — |
| 3.20 „ | 1,400° | 1,300° | — | — |
| 3.25 „ | 1,480° | 1,400° | — | — |
| 3.30 „ | 1,520° | 1,400° | — | 100° |
| 3.35 „ | 1,600° | 1,300° | — | 100° |
| 3.40 „ | 1,650° | 1,400° | — | 100° |
| 3.45 „ | 1,800° | 1,520° | — | 150° |
| 3.50 „ | 1,650° | 1,600° | — | 150° |
| 3.55 „ | 1,900° | 1,700° | 150° | 220° |
| 4.0 „ | 2,000° | 1,780° | 120° | 250° |
| 4.5 „ | 1,950° | 1,700° | 150° | 250° |

*Note.*—The bulging of the iron studs as they became heated allowed the head of the partition to drop slightly and so made a slight space over it. Flame then spread over the top of the partition by means of the wood beams forming the ceiling to the hut, these beams being so laid as to cover both the chamber and the passage. This increased the temperature on the outside of the partition (in passage).

The temperature as shown by the automatic record Point 5 (inside) was as follows:—




## OBSERVATIONS AFTER TEST.

On April 12th a photograph was taken as shown in Fig. 6.

The partition lay in sections, almost all the plaster being detached from both faces and crumbling at touch.

## GENERAL ARRANGEMENTS.

The Test was carried out according to the procedure laid down by the Executive for investigations of this

description, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. Matt Garbutt, A.M.I.C.E., A.R.I.B.A. (Directing Member).
Mr. Max Clarke, A.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E, superintended in the Instrument Room.

The Executive was represented by :—

Mr. Edwin O. Sachs (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E., M.Can.Soc.C.E.
Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.

The general body of Members was represented by :—

Mr. F. Sizer Capon, Architect's Department, L.C.C
Mr. Henry Lea, M.Inst.C.E., M.I.Mech.E., M.I.E.E.
Mr. T. Lewis Banks, F.R.I.B.A.
Mr. Harold Busbridge.
Mr. J. Howard Colls.
Mr. H. H. Ray.

The Fireproof Partition Syndicate, Ltd., was represented by :—

Mr. T. I. Cammell, Mr. H. L. Cunnah, Mr. Howard Payne, Dr. G. S. Street, and Mr. George Traill.

The following visitors attended by special invitation of the Executive :—Mr. J. C. Stransom (Architect's Department, L.C.C.), Mr. Robert Robertson (Architect's Department, L.C.C.), Mr. W. G. Perkins (Architect's Department, L.C.C.), Mr. P. G. Killick (Vestry Surveyor, Clerkenwell), Mr. J. Rush Dixon (Vestry Surveyor, Shoreditch), Mr. W. Busbridge, and Mr. W. Buchan.

Signed,

*For the Sub-Committee conducting the Test*:

MATT. GARBUTT (*Directing Member*).

*For the Commercial Section*:

FREDERIC R. FARROW.

*For the Executive*:

EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.
H. S. TAYLOR
(*Assist. Secretary*).

*Date—July 1st*, 1900.

Verified a true copy of the Report ordered by the published.
WILLIAMSON, HILL & CO.
(*Solicitors*).

*Date—July 15th*, 1900.

FIG. 1. TEMP 900° TIME 4.6 pm

FIG. 2 TEM

FIG. 5. TEMP 1600° TIME 4.37 pm.

FIG. 6. TEM

FIG. 9. TEMP 1900° TIME 5.2 pm.

FIG 10. TEI

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 54.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH DOORS.

## A $2\frac{5}{8}$ IN. DOOR IN OAK, CONSTRUCTED IN THREE THICKNESSES.

## A $2\frac{5}{8}$ IN. DOOR OF TEAK, CONSTRUCTED IN THREE THICKNESSES.

## Particulars

OF

EXPERIMENTAL FIRE TESTS.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF

THE BRITISH FIRE PREVENTION COMMITTEE

*(Founded, 1897—Incorporated, 1899)*

1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence nett.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superindending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS Three Casements glazed with Wired Glass by Messrs. Pilkington Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32-oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete.

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*

EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; Past President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.
SIR DOUGLAS FOX, Past President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
ALEXANDER STENNING, F.R.I.B.A.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
MATT. GARBUTT, A.M.Inst C.E., A.R.I.B.A.
T. E. GATEHOUSE, F.R.S.Ed., A.M.Inst.C.E.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.

*Chairman of the Commercial Section:*

FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*

WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*

JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*

LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*

T. KISSACK.

*Assist.-Secretary:*

H. S. TAYLOR.

*Offices:*

1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE.*

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

In preparing this Report on Oak and Teak Doors, constructed in three thicknesses, there is little to remark beyond saying that it should be read in connection with reports on similar doors by way of comparison.

Attention, however, is called to the construction of the doors with the aid of wood pins, and that the boards were not grooved or tongued, but simply butt-jointed.

EDWIN O. SACHS.

LONDON,

*December* 31*st*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

EXPERIMENTAL FIRE TESTS

*CONDUCTED BY THE EXECUTIVE*

OF THE

# British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

FIRE TESTS Fa & Ga.—APRIL, 11TH, 1900.

## (Fa) A $2\frac{5}{8}$ in. Door of Oak, constructed in three thicknesses.

## (Ga) A $2\frac{5}{8}$ in. Door of Teak, constructed in three thicknesses.

---

### OBJECT OF TEST.

To record the effect of a fire of one hour and a quarter, gradually increasing to a temperature of 2,000° Fahr.

*Note.*—The fire was to be applied from one side, and the doors were to open inwards on to the fire side.

The door-openings were to be approximately 7 ft. by 3 ft.

### SUMMARY OF EFFECT.

#### OAK DOOR.

In 60 minutes flame came through western corner and glow appeared at bottom of door.

In 67 minutes the boards at each side of centre joint bulged outwards $1\frac{1}{2}$ in. and joint opened.

In 75 minutes opening in the centre widened and flames came through freely; the flames at top of door had extended across the whole width.

Two of the three thicknesses had disappeared, the outer thickness remaining in position.

### Teak Door.

In 17 minutes flame appeared at western top corner.

In 36 minutes the flame had extended across two-thirds of top of door.

In 57 minutes glow appeared at bottom of door.

In 75 minutes flames had extended across the whole of the top of door and holes along bottom.

The inner thickness had disappeared; the centre thickness was charred through, but in position; the outer thickness had about 4 in. at the top burnt away.

## DESCRIPTION OF THE TESTING PLANT.

*(See Figs* A, B, C *and* D.*)*

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 6 Hut.

The hut was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the hut was 9 ft., 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire-clay. The chamber measured 10 ft. by 7 ft. 10 in.

A brick wall, 14 in. thick, was built across the hut from east to west, 13 in. to the south of the north wall, and carried up to the ceiling; there were two openings in this, 7 ft. high and 3 ft. 3 in. wide, arched over with brick arches in two half-brick rings, and the spaces between the arches and the frames were filled in with bricks. The wall was built of gauged stuff.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3 and 4, points Nos. 2 and 3 being outside the doors, and the others on the fire side of the

AST

4·5
shed
ters
cording

Draught-Holes

DR

4

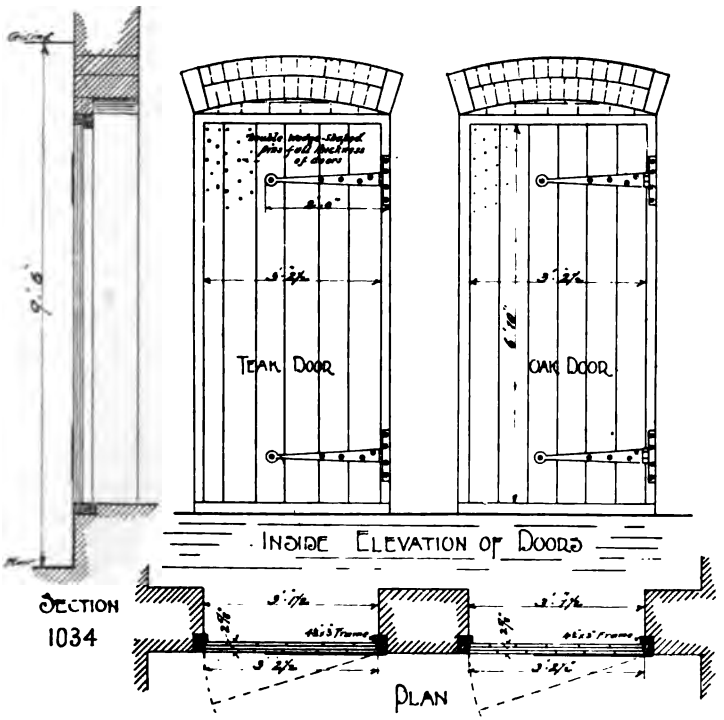
DUF

doors. A continuous record was also taken from point No. 5, on the fire side.

There were observation holes on the east and west walls, closed by moveable iron shutters.

The draught holes were in the east and west walls.

The photographs were taken by daylight.




*Figs.* E, F. DETAILS OF DOORS.

## CONSTRUCTION OF THE DOORS.

*(See Figs.* E *and* F.*)*

The door on the east side was of oak, and that on the west side of teak.

The doors were of the same style and constructed in the same manner, being 6 ft. 10 in. high, by 3 ft. $2\frac{1}{2}$ in. wide, and formed of three thicknesses of $\frac{7}{8}$-in. boards, between 6 in. and 7 in. wide.

The boards were not grooved or tongued, but simply butt-jointed; they were secured together by $\frac{3}{8}$-in. double wedge-shaped wooden pins of the same material as the doors, driven through the entire thickness of the door, there being about 240 to each door.

The doors were hung with two wrought iron cross garnett hinges screwed to the doors and frames, nine 1-in. screws to each hinge, the doors were also secured on the

OAK. TEAK.

*Fig.* G. VIEW OF DOORS BEFORE COMMENCEMENT OF TEST.

outside with four 6-in. iron barrel bolts (two at the top and two at the bottom) to frames of the same material as the doors.

The frames were $4\frac{1}{2}$ in. by 3 in., rebated and splayed, as shown in the drawing (*Figs.* E *and* F), and were secured to deal plugs driven into the walls.

The joints of brick-work all around the frames were pointed with mortar.

## THE TEST.

(*See Figs.* 1 *to* 12, *and* G *to* P.)

On April 11th, 1900, the test was undertaken. The following being the log:—

The meteorological observations taken at 3 p.m., at the Botanical Gardens, Regent's Park, read as follows:—

OAK. TEAK.

*Fig.* N. VIEW SHOWING CONDITION OF DOORS AT 5.21 P.M., AFTER THE APPLICATION OF WATER.

State of Weather, fair; Wind, W.S.W.; Barometer, 29·52 in.; Attached Thermometer, 53° Fahr.; Dry Bulb, 54° Fahr.; Wet Bulb, 48·5° Fahr. Remarks, South-westerly wind; fine afternoon.

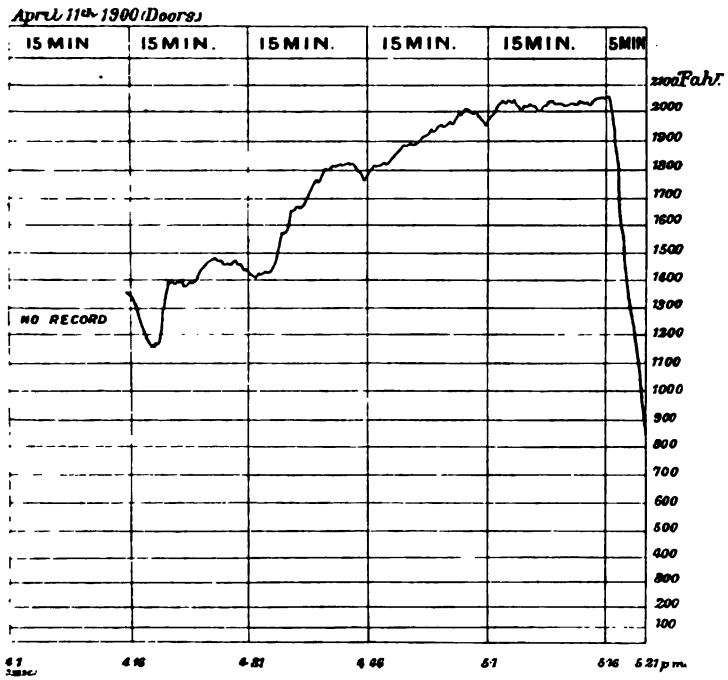
The following temperature observations were taken during the test, from points Nos. 1, 2, 3 and 4, and the diagram below shows the continuous record from point No. 5.

## Observations taken at Points Nos. 1, 2, 3 & 4.

*From* 4.10 *p.m. to* 5.19 *p.m.—April* 11*th*, 1900.

| Time. | Inside. | | Outside | |
|---|---|---|---|---|
| | No. 1. Fahr. | No. 4 Fahr. | No. 2. Fahr. | No. 3. Fahr. |
| 4.10 p.m. | 950° | 900° | — | — |
| 4.13 „ | 1,200° | 1,300° | — | — |
| 4.16 „ | 1,100° | 1,150° | — | — |
| 4.19 „ | 1,250° | 1,400° | — | — |
| 4.22 „ | 1,250° | 1,380° | — | 150° |
| 4.25 „ | 1,350° | 1,460° | — | 210° |
| 4.28 „ | 1,350° | 1,450° | — | 200° |
| 4.31 „ | 1,320° | 1,400° | — | 175° |
| 4.34 „ | 1,450° | 1,520° | — | 150° |
| 4.37 „ | 1,600° | 1,600° | — | 200° |
| 4.40 „ | 1,700° | 1,710° | — | 190° |
| 4.43 „ | 1,750° | 1,775° | — | 190° |
| 4.46 „ | 1,710° | 1,750° | — | 175° |
| 4.49 „ | 1,800° | 1,800° | — | 150° |
| 4.52 „ | 1,800° | 1,800° | — | 150° |
| 4.55 „ | 1,880° | 1,880° | — | 140° |
| 4.58 „ | 1,900° | 1,900° | — | 150° |
| 5.1 „ | 1,900° | 1,900° | — | 200° |
| 5.4 „ | 1,940° | 1,940° | — | 210° |
| 5.7 „ | 1,950° | 1,950° | — | 250° |
| 5.10 „ | 1,950° | 1,960° | — | 300° |
| 5.13 „ | 1,950° | 1,970° | — | 460° |
| 5.16 „ | 1,960° | 1,980° | 175° | 600° |
| 5.19 „ | 14,00° | 1,500° | 250° | 600° |

## Automatic Record at Point No. 5.




*Wednesday, April 11th*, 1900.

### Oak Door.

At 4.1 p.m. gas lighted.

*Observations from the outside.*

At 4.7 p.m. smoke came through the joint between top of door and frame.

At 4.20 p.m. moisture exuded along top of door, and also slightly on upper part of west side.

### Teak Door.

At 4.1 p.m. gas lighted.

*Observations from the outside.*

At 4.7 p.m. smoke came through the joint between top of door and frame.

At 4.18 p.m. (17 minutes) flame appeared at western top corner of door. (See Fig. H, 4.22 p.m., and Fig. 3, 4.22 p.m.—21 minutes.)

At 4.30 p.m. moisture exuded also along bottom of door.

At 4.40 p.m. more moisture at top and bottom of door, but not at west side. Smoke issuing from western top corner.

At 4.48 p.m. moisture at bottom and east side of door, and also exuding through pins all over the door. The door had warped away from rebate, $\frac{3}{8}$ in. at centre of east side, $\frac{3}{16}$ in. at centre of west side.

At 5.1 p.m. flame first came through top western corner, and glow appeared at bottom of door near eastern corner. (See Fig. J, 5.1 p.m.—60 minutes, also Fig. 9, 5.2 p.m.)

At 4.30 p.m. flame continued, but not so fiercely as at first. Oil exuded down the west side.

At 4.35 p.m. flame had extended across two-thirds of top of door, and 4 inches down west side. (See Fig. 5, 4.37 p.m.—36 minutes.)

At 4.40 p.m. flame had lessened.

At 4.50 p.m. flames continued to issue from western corner. (See Figs. 6 and 7, 4.47 p.m. and 4.52 p.m.)

At 4.57 p.m. one flash of flame appeared below bolt at lower western corner.

At 4.58 p.m. glow appeared through centre of bottom of door, and at lower western corner.

At 5.1 p.m. the glow at centre had become stronger, and that at western corner had developed into a hole. (See Fig. J., 5.1 p.m.—60 minutes.)

At 5.8 p.m. flames at top western corner; strong glow all along bottom of door.

Five holes appeared down the centre joint of outer thickness, the two centre boards bulging outwards 1½ ins. at centre joint.

At 5.10 p.m. flame at top of door had increased considerably. Both glow spots at bottom had developed into holes. (See Fig. K, 5.10 p.m.—69 minutes; also Fig. 11, 5.12. p.m)

At 5.13 p.m. flames had extended half way along top, and also appeared at eastern top corner.

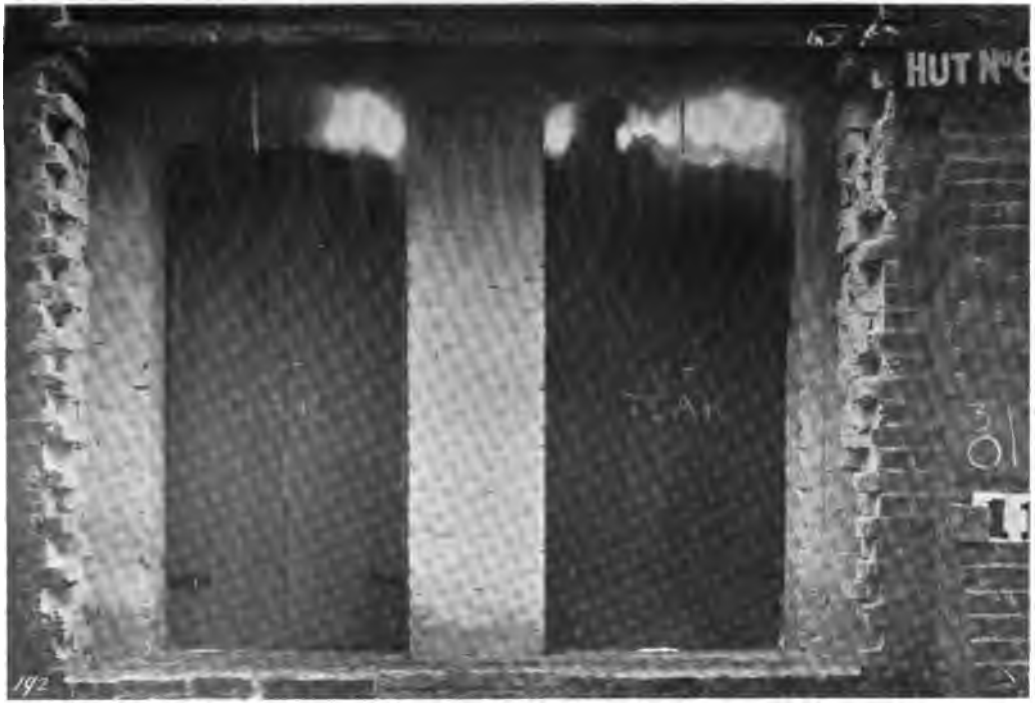
Flame came through parts of centre joint, the three upper holes having extended and joined; the lower two holes in centre joint remaining as a strong glow.

The glow along bottom of door had become stronger. (See Figs. K, 5.10 p.m.—69 minutes; also L, 5.13 p.m. —72 minutes; and Fig. 11, 5.12. p.m.)

At 5.15 p.m., in addition to the above, a hole had appeared at eastern lower corner. (See Fig. M, 5.16 p.m.—75 minutes; also Fig. 12, 5.17. p.m.)

OAK. TEAK.

*Fig. 3.* VIEW SHOWING CONDITION OF DOORS AFTER 60 MINUTES.

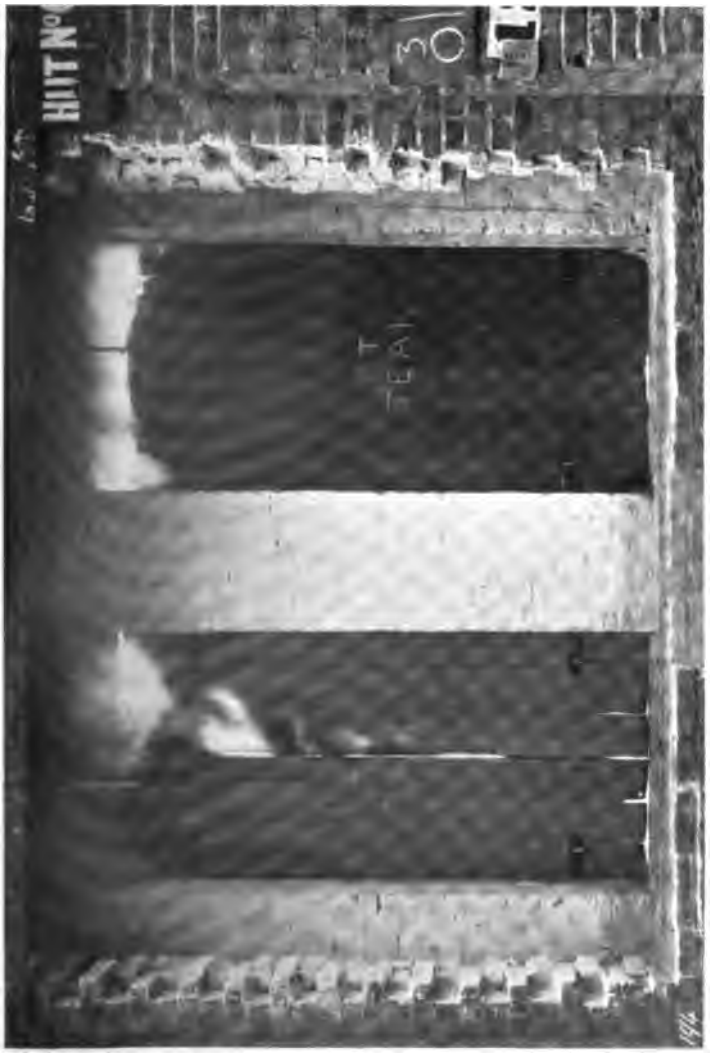



OAK. TEAK.

*Fig.* K. VIEW SHOWING CONDITION OF DOORS AFTER 69 MINUTES.

OAK. TEAK.

*Fig.* 1. VIEW SHOWING CONDITION OF DOORS AFTER 72 MINUTES.




OAK.

TEAF.

*Fig.* M. VIEW SHOWING CONDITION OF DOORS AFTER 75 MINUTES.

At 5.16 p.m. opening of centre joint widening, and flames coming through freely. (See Fig. M, 5.16 p.m. — 75 minutes; also Fig. 12, 5.17. p.m.)

At 5.16 p.m. gas shut off.

At 5.17 p.m. water applied.

At 5.16 p.m. gas shut off.

At 5.17 p.m. water applied.

*Fig.* O. VIEW SHOWING CONDITION OF THE OUTSIDE OF DOORS AFTER TEST AND REMOVAL.

*Observations on the inside.*

At 4.7 p.m. door well alight, excepting at eastern lower corner.

*Observations on the inside.*

At 4.7 p.m. door well alight, excepting at eastern lower corner.

At 4.12 p.m. blazing all over.

At 4.12 p.m. blazing all over.

*Note.*—From about 4.10 p.m. to about 4.30 p.m., at intervals, it was noticed that sometimes one door, and sometimes the other, presented a charred black appearance without any sign of ignition; these intervals were succeeded by times when the doors would become again ignited and covered with flames.

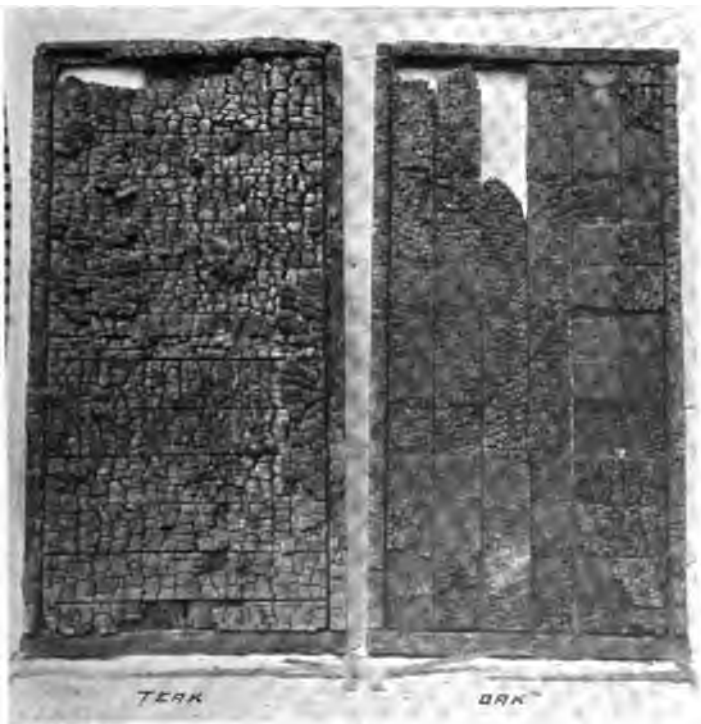



*Fig.* P. VIEW SHOWING CONDITION OF THE INSIDE OF DOORS AFTER TEST AND REMOVAL.

After about 4.30 p.m. this phenomenon ceased, and both doors appeared to burn continuously on the inside.

| | |
|---|---|
| At 4.30 p.m. burning freely. | At 4.30 p.m. burning freely. |
| At 4.45 p.m. the inner thickness appeared to be burnt through, and the charred particles began to curl up. | At 4.45 p.m. the inner thickness had the appearance of being charred through, but the surface had not begun to disintegrate. |
| At 4.48 p.m. charred particles of inner thickness began to fall off. | |
| At 5.0 p.m. nearly all of inner thickness had disappeared, the centre thickness being much charred, but still retaining its form. | At 5.0 p.m. some of inner thickness had fallen, but not more than about one half. |
| At 5.7 the lower hinge was quite detached from door. | At 5.7 the lower hinge had buckled, the end being detached from door (it fell soon afterwards). |
| At 5.10 lower hinge had fallen off. | |

*Note.*—The upper hinges of both doors fell off before conclusion of test: the inside of hut was so full of flame that the hinges were not visible after 5.10.

## OBSERVATIONS AFTER TEST.

*(See Figs.* N, O *and* P.*)*

| Oak Door. | Teak Door. |
|---|---|
| The whole of the inner thickness had disappeared. | The whole of the inner thickness had disappeared, excepting one small piece of charred wood on eastern (hinge) side. |
| The centre thickness had also gone, with the exception of a few pieces of charred particles on the eastern (hinge) side. | The centre thickness was in position, but was almost entirely charred. |

The outer thickness remained in position, most of its inner surface being charred, the outer surface being intact, excepting the upper portions of three boards. (See Figs. O and P.)

The frame was deeply charred, especially at the head, the sill being not much damaged.

The outer thickness was practically unharmed except for about 4 ins. at the top, where flames had broken through, and for small holes at eastern lower corner, and at centre of bottom of door. (See Figs. O and P.)

The frame was deeply charred, especially at the head, the sill being not much damaged.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description and conducted by a Sub-Committee of the Executive, comprising:—

Mr. Chas. E. Goad, M.Am.Soc.C.E., M.Can.Soc.C.E. (Directing Member).
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

The Executive was represented by:—

Mr. Edwin O. Sachs (Chairman).
Mr. Max Clarke, A.R.I.B.A.
Mr. Matt Garbutt, A.M.I.C.E., A.R.I.B.A.

The general body of members was represented by:—

Mr. F. Sizer Capon, Architect's Department, L.C.C.
Mr. T. Lewis Banks, F.R.I.B.A.
Mr. Henry Lea, M.Inst.C.E., M.I.Mech.E., M.I.E.E.

Mr. Harold Busbridge, M.S.I.
Mr. J. Howard Colls.
Mr. H. H. Ray.

The Fireproof Partition Syndicate was represented by :—

Mr. T. I. Cammell, Mr. H. L. Cunnah, Mr. Howard Payne, Dr. G. S. Street, Mr. George Traill.

The following visitors attended by special invitation of the Executive :—

Mr. P. Stransom, Architect's Department, L.C.C.; Mr. Robert Robertson, Architect's Department, L.C.C.; Mr. W. G. Perkins, Architect's Department, L.C.C.; Mr. P. G. Killick, Vestry Surveyor, Clerkenwell; Mr. J. Rush Dixon, Vestry Surveyor, Shoreditch; Mr. W. Busbridge; Mr. W. Buchan.

Signed,

*For the Sub-Committee conducting the Test:*

CHAS. E. GOAD (*Directing Member*).

*For the Commercial Section:*

FREDERIC R. FARROW.

*For the Executive:*

EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
*(Asst. Secretary).*

*Date—December* 31*st*, 1900.

View from Below after Test.

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 55.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH FLOORS.

## A FLOOR

OF

## DEAL JOISTS AND COKE BREEZE CONCRETE

WITH

## EXPANDED METAL AND PLASTER CEILING.

## Particulars

OF

## EXPERIMENTAL FIRE TEST.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
*(Founded, 1897—Incorporated, 1899),*
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence nett.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

No. 1.—WHAT IS FIRE PROTECTION?
No. 2.—AMERICAN OPINIONS ON FIRE PROTECTION.
No. 3.—THE PARIS BAZAAR FIRE.
No. 4.—THEATRE EXITS
No. 5.—THE NEW YORK FIRE DEPARTMENT.
No. 6.—COTTON FIRES AND COTTON BALES.
No. 7.—"FIRE-RESISTING" FLOORS USED IN LONDON.
No. 8.—FIRE SERVICE IN FACTORIES, WORKS, &c.
No. 9.—LESSONS FROM FIRE AND PANIC.
No. 10.—HOW TO BUILD "FIRE-PROOF."
No. 11.—THE TESTS WITH UNPROTECTED COLUMNS.
No. 12.—THE EFFECT OF FIRE.
No. 13.—THE TESTING STATION OF THE B.F.P.C.
No. 14.—OFFICIAL FIRE TESTS WITH FLOORS (No. 1).
No. 15.—CONFLAGRATIONS DURING THE LAST TEN YEARS
No. 16.—EXPERIMENTAL FIRE TESTS WITH FLOORS (A).
No. 17.—THE TALL BUILDING UNDER TEST OF FIRE.
No. 18.—EXPERIMENTAL FIRE TESTS WITH FLOORS (B).
No. 19.—OFFICIAL FIRE TESTS WITH CEILINGS (No. 2).
No. 20.—OFFICIAL FIRE TESTS WITH GLAZING (No. 3).
No. 21.—EXPERIMENTAL FIRE TESTS WITH FLOORS (C).
No. 22.—EXPERIMENTAL FIRE TESTS WITH PARTITIONS (D & E).
No. 23.—OFFICIAL FIRE TESTS WITH FLOORS (No. 4).
No. 24.—EXPERIMENTAL FIRE TESTS WITH DOORS (G, H, AND I).
No. 25.—EXPERIMENTAL FIRE TESTS WITH DOORS (K AND L).
No. 26.—EXPERIMENTAL FIRE TESTS WITH DOORS (M AND N).
No. 27.—OFFICIAL FIRE TEST WITH PARTITIONS (No. 7).
No. 28.—OFFICIAL FIRE TESTS WITH CEILINGS (No. 8).
No. 29.—OFFICIAL FIRE TESTS WITH GLASS (No. 5).
No. 30.—OFFICIAL FIRE TESTS WITH GLASS (No. 6).
No. 31.—OFFICIAL FIRE TESTS WITH GLASS (No. 11).
No. 32.—OFFICIAL FIRE TESTS WITH GLASS (No. 12).
No. 33.—EXPERIMENTAL PLAIN GLASS TESTS (O, P AND Q).
No. 34.—EXPERIMENTAL FIRE TESTS WITH FLOORS (R).
No. 35.—EXPERIMENTAL FIRE TESTS WITH DOORS (S AND T).
No. 36.—OFFICIAL FIRE TESTS WITH TREATED WOOD (No. 9).

---

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

..... ... .....

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.,C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.
SIR DOUGLAS FOX, President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
THE RIGHT HON. THE EARL OF STRADBROKE.
ALEXANDER STENNING, F.R.I.B.A.
SIR ARTHUR SULLIVAN, Mus. Doc.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President, The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A.
District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C.E., M.I.Mech.E.,
Past President, Municipal Electrical Association.

*Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL, AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5, Coleman Street, E.C

*Bankers:*
LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W

*Resident Engineer:*
T. KISSACK.

*Hon. Secretary:*
GEORGE E. MONCKTON, M.A.

*Offices:*
1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE.*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

In the report presented herewith the effect of a fire of two hours duration is recorded in respect to a floor of ordinary soft wood joists filled in with concrete, the concrete, however, affording protection to the joists from below, and the soffit comprising a plaster ceiling on "expanded metal" lathing, this lathing having at the same time been employed for purposes of construction in the place of the usual centering which is generally applied where concrete fillings are specified.

This report should be read in conjunction with the reports on floors where ordinary iron or wood joists were used without a protective covering.

EDWIN O. SACHS.

LONDON,
*May 4th*, 1900

SOTHERAN

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman*

EXPERIMENTAL FIRE TESTS

*CONDUCTED BY THE EXECUTIVE*

OF THE

# British Fire Prevention Committee.

[FOUNDED, 1897.—INCORPORATED, 1899.]

FIRE TEST No. Fa.—MARCH, 28TH, 1900.

## A Floor of Deal Joists and Coke Breeze Concrete, with Expanded Metal and Plaster Ceiling.

### OBJECT OF TEST.

To record the effect of a fire of two hours, commencing with a temperature of 500° Fahr., gradually increasing to a temperature not exceeding 2,300° Fahr., followed by the application of a stream of water for two minutes.

*Note.*—The area of the floor under investigation was to be 100 feet superficial in the clear (10 ft. by 10 ft.).

The floor was to be loaded with 100 lbs. per foot distributed.

The time allowed for construction and drying was four weeks (Winter).

### SUMMARY OF EFFECT.

In 28 minutes plaster began to fall in patches from the ceiling, and continued to fall at intervals till the end of the test, when water was applied and further plaster was washed away.

No other effect of the fire was noticeable, and at the conclusion of the test the floor was intact and carried its load.

## DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The testing chamber was located at the Committee's Testing Station, and was known as "No. 2 Hut."

The chamber was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the floor tested was 7 ft. 6 in. above the pavement of the chamber.

The door-opening on the south side measured 2 ft. 6 in. by 6 ft. 6 in., and was bricked up on the morning of the test.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, each 10 ft. by 3 ft., as shown.

Two Robert-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point No. 5, and the second to take four observation records from points 1, 2, 3, and 4.

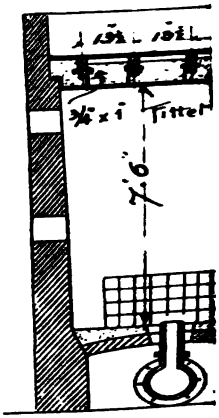
The load was of bricks, distributed evenly over the surface of the floor.

There were two observation holes in the north wall, one in the east wall, one in the west wall and one in the south wall in door-opening.

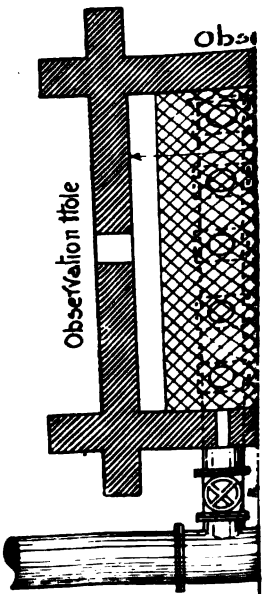
The draught holes were in the east and west walls.

The photographs were taken partly by daylight and partly by flashlight.

The stream of water was applied through a branch with ½-in. nozzle, and supplied from a manual fire-engine equipped with a pressure gauge.




SECTI

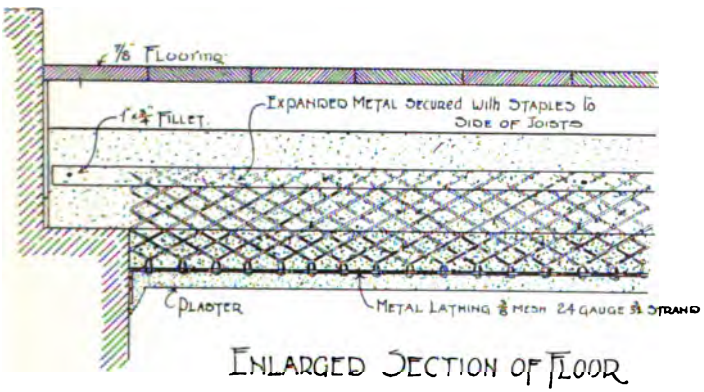



1024 PLA

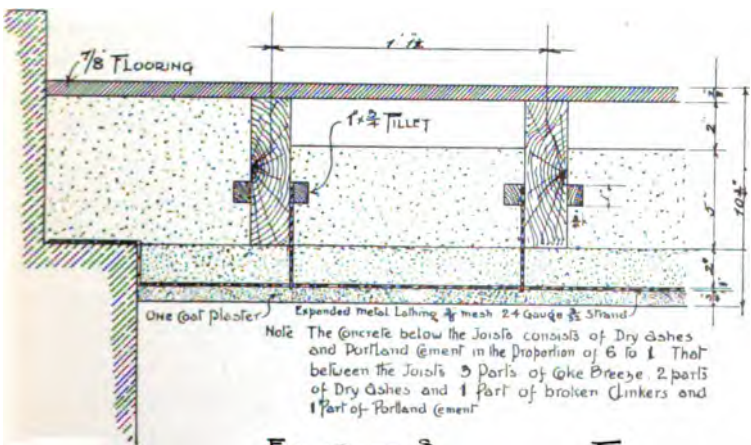
## CONSTRUCTION OF THE FLOOR.

(*See Figs.* 1 *to* 5.)

The construction of the floor, illustrated in Figs. 1 to 5, was as follows:—


7/8 Flooring
1"x 3/4" Fillet
Expanded Metal Secured with Staples to Side of Joists
Plaster
Metal Lathing 3/8 Mesh 24 Gauge 3/4 Strand

ENLARGED SECTION OF FLOOR


7/8 Flooring
1"x 3/4" Fillet
One Coat Plaster
Expanded metal Lathing 3/8 mesh 24 Gauge 3/4 Strand
Note The Concrete below the Joists consists of Dry Ashes and Portland Cement in the Proportion of 6 to 1. That between the Joists 5 Parts of Coke Breeze 2 parts of Dry Ashes and 1 Part of broken Clinkers and 1 Part of Portland Cement

1025 ENLARGED SECTION OF FLOOR

THE FLOOR. *Fig.* 5. DETAILS.

On February 27th the nine joists supporting the floor and consisting of second quality fir, 2 in. by 7 in., spaced

13½ in. centre to centre, were fixed; they ran north and south, and rested on the offsets of the walls, 4½ in. at each end.

On one side of each joist, and running the whole length, a strip of expanded metal, 5 in. deep, ¾ in. mesh, 16 gauge, was secured with 1 in. staples. This was brought below the joists 2 in., and the strands of the lower mesh were cut in two and bent back, forming a hook for the support of the lathing used for ceiling and centering (see Fig. 5).

On each side, and along the whole length of each joist, a 1 in. by ¾ in. wood fillet was nailed, two inches from the lower edge.

On March 1st, expanded metal lathing was fixed, and used both for the centering and to carry the plaster of ceiling. This was in widths of 2 ft. 3 in., and known as No. 1 lathing, ⅜ in. mesh, 24 gauge, $\frac{3}{32}$ strand.

This horizontal lathing was secured to the vertical strips of lathing, nailed to the joists before mentioned, by cutting and bending the strands of the lower mesh, and it was further secured with No. 18 gauge galvanized iron wire (see Fig. 5).

The concrete below the joists was then filled in. This was 2 in. thick, and made of small dry ashes and Portland cement, in the proportion of six parts of ashes to one part of cement. It was turned over four times dry and four times wet, 34·50 gallons of water being used to ¾ yd. of material.

It was carried to the floor in buckets, emptied, and spread over the surface and well pushed under the joists with a trowel.

On March 6th the concrete between the joists was put in. This was 5 in. thick, made in the proportion of three parts of coke breeze, two parts of dry ashes, one

part of clinkers broken sufficiently small to pass a 1 in. mesh, and incorporated with one part of Portland cement. It was mixed four times dry and four times wet, 21.55 gallons of water being used to each $\frac{3}{4}$ yd. of material. The ashes and clinkers before being used were quite dry, the coke breeze being slightly damp.

The concrete was carried to the roof in buckets, emptied, and spread over the surface between the joists and stamped down lightly with the feet, and levelled with a trowel.

The hut was covered with a tarpaulin, until March 21st, when it was removed to enable the deal flooring to be laid. This was $\frac{7}{8}$ in. thick and in 6-in. widths, nailed to joists with floor brads, two nails to each joist. After the flooring was laid the hut was again covered with a tarpaulin until the morning of the test.

On March 12th the ceiling was plastered one coat. The coarse stuff, supplied by a local contractor, ready made, was stated to consist of lime, sand, and hair, in the proportion of 1 yd. of sand, 6 bushels of lime, and 14 lbs. of hair.

Owing to the uneven surface of the lathing, caused by the weight of concrete above, some parts of the ceiling were thicker than others, and the plaster averaged at least 1 in. thick.

On March 13th one coke fire was put into the hut and kept in all day, and on the following day the plasterer went over the ceiling with a "float." The floor was then left until the test began.

On March 19th one coke fire was lighted in the hut and was kept in daily till March 24th.

*Note.*—The 7 inches of concrete when dry weighed about 40 lbs. per foot super. The weight per cubic foot was about 67 lbs.

On March 6th, during the operation of concreting, the weather report was as follows:—State of weather, overcast; Rain, none; Wind, N.N.W.; Barometer, 30·18 in. Attached Thermometer, 42° Fahr.; Dry Bulb, 38° Fahr.; Wet Bulb, 35·2° Fahr.; Remarks, dry afternoon, very cold.

During March the rainfall for the month (taken at Camden Square) was ·79 inches, with a maximum of ·41 inches on March 18th. The maximum temperature was 58·6° Fahr. (March 12th); minimum, 23·4° Fahr. (March 18th).

## PREPARATIONS FOR THE TEST.

On March 26th and 27th, the area of the floor, to an extent of 81 square feet, was loaded with bricks weighing 8,100 lbs., making a load equal to 100 lbs. per square foot.

## THE TEST.

On March 28th the test was undertaken. The following is the log of the test:—

At 3.37 p.m. the floor was intact.

At 3 p.m. the Meteorological observations taken at he Botanic Gardens, Regent's Park, read as follows:—

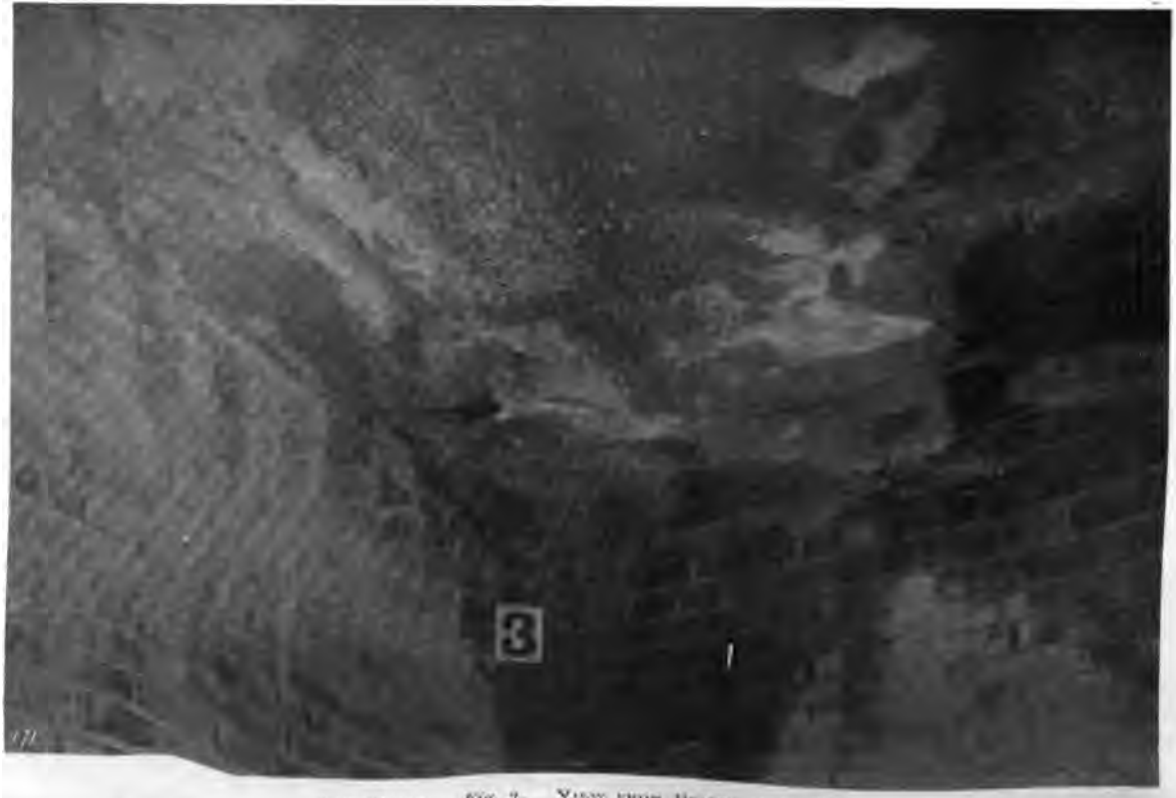
State of weather, overcast; Rain, none; Wind, N.N.E.; Barometer, 29·54 in.; Attached Thermometer, 43° Fahr.; Dry Bulb, 39·2° Fahr.; Wet Bulb, 36·8° Fahr.; Remarks, dull afternoon, cold, hazy.

The table and diagram given below show the temperatures taken from the five pyrometer observation points in the hut, as shown on the drawings as Nos. 1, 2, 3 and 4, and one automatic record from point No. 5.

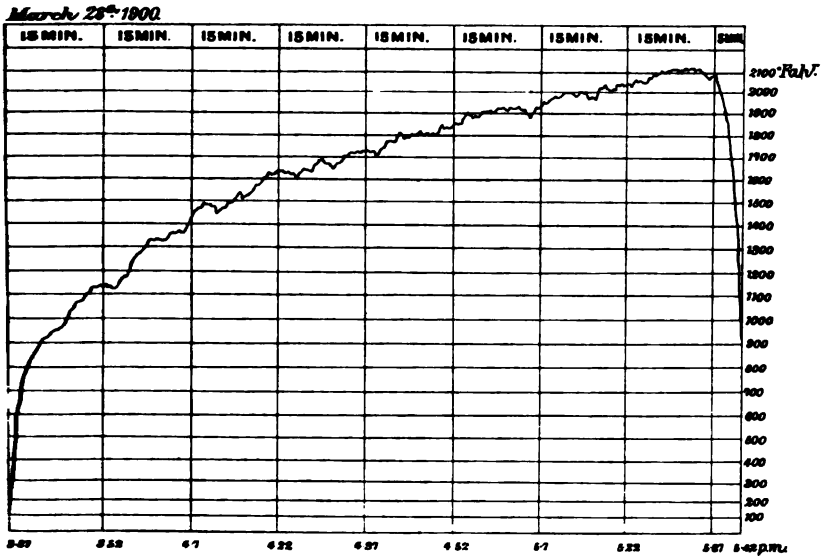
## OBSERVATIONS TAKEN AT POINTS NOS. 1, 2, 3 AND 4.

*From* 3.51 *p.m. to* 5.41 *p.m.*

| TIME. | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| | Fahr. | Fahr. | Fahr. | Fahr. |
| 3.51 p.m. | 675° | 700° | 800° | 650° |
| 3.56 ,, | 875° | 980° | 980° | 850° |
| 4.1 ,, | 1,000° | 1,125° | 1,150° | 950° |
| 4.6 ,, | 1,120° | 1,200° | 1,300° | 1,070° |
| 4.11 ,, | 1,200° | 1,275° | 1,360° | 1,150° |
| 4.16 ,, | 1,320° | 1,400° | 1,550° | 1,280° |
| 4.21 ,, | 1,375° | 1,450° | 1,550° | 1,300° |
| 4.26 ,, | 1,470° | 1,520° | 1,700° | 1,400° |
| 4.31 ,, | 1,500° | 1,550° | 1,700° | 1,450° |
| 4.36 ,, | 1,530° | 1,610° | 1,750° | 1,500° |
| 4.41 ,, | 1,600° | 1,640° | 1,800° | 1,550° |
| 4.46 ,, | 1,650° | 1,680° | 1,860° | 1,600° |
| 4.51 ,, | 1,700° | 1,720° | 1,900° | 1,640° |
| 4.56 ,, | 1,700° | 1,750° | 1,900° | 1,650° |
| 5.1 ,, | 1,780° | 1,800° | 1,960° | 1,720° |
| 5.6 ,, | 1,820° | 1,840° | 1,960° | 1,750° |
| 5.11 ,, | 1,900° | 1,900° | 2,000° | 1,800° |
| 5.16 ,, | 1,900° | 1,900° | 2,020° | 1,800° |
| 5.21 ,, | 1,920° | 1,950° | 2,050° | 1,850° |
| 5.26 ,, | 2,000° | 2,000° | 2,080° | 1,900° |
| 5.31 ,, | 2,000° | 2,025° | 2,100° | 1,900° |
| 5.36 ,, | 2,000° | 2,020° | 2,100° | 1,900° |
| 5.41 ,, | 1,500° | 1,100° | 750° | 1,200° |




THE 2ND FLOOR. FIG. 7.—VIEW FROM BELOW AFTER TEST.




At 3.37 p.m. the gas was lighted.

At 4.5 p.m. about 1½ ft. super of plaster had fallen from the ceiling at the N.W. corner, exposing the metal lathing. The centre of the fallen patch was about 2 ft. 3 ins. from the west wall and 9 ins. from the north wall.

At 4.9 p.m. two more pieces of plaster had fallen, one piece, having an area of about 1 ft., close to the centre of the north wall, and the other piece, about 2 ft. in area, in the N.E. corner.

At 4.12 p.m. the plaster to ceiling all along the north side of hut and about 12 ins. from the north wall was in a damaged condition.

At 4.15 p.m. the plaster to ceiling for a width of about 12 ins. from the east and west walls bulging and blowing off, but only the surface affected, the lathing not being exposed.

Also a piece of plaster about 2 ft. by 9 ins. had fallen

from the ceiling, about 2 ft. away from south wall, exposing the lathing.

At 4.19 p.m. a piece of plaster about 9 ins. by 9 ins. had fallen from the S.W. corner, and a blister was forming against the wall.

At 4.20 p.m. the plaster to ceiling all along the south side of hut and about 12 ins. from south wall was blistered and damaged.

At 4.25 p.m. the margin of the ceiling, about 12 ins. all round the hut, had its surface destroyed, but the centre part was generally unaffected, with the exception before mentioned at 4.15 p.m.

At 4.27 p.m. a blister forming in plaster, having its centre about 4 feet from east wall and 3 feet from south wall, and with a crack about 12 ins. long running east and west.

At 4.38 p.m. steam arising in considerable volume from the upper surface of floor at junction with north wall, and a little smoke arising from a corresponding position on the west.

At 4.45 p.m. a thermometer placed on the top surface of the concrete under the boards at the N.W. corner registered 80° Fahr.

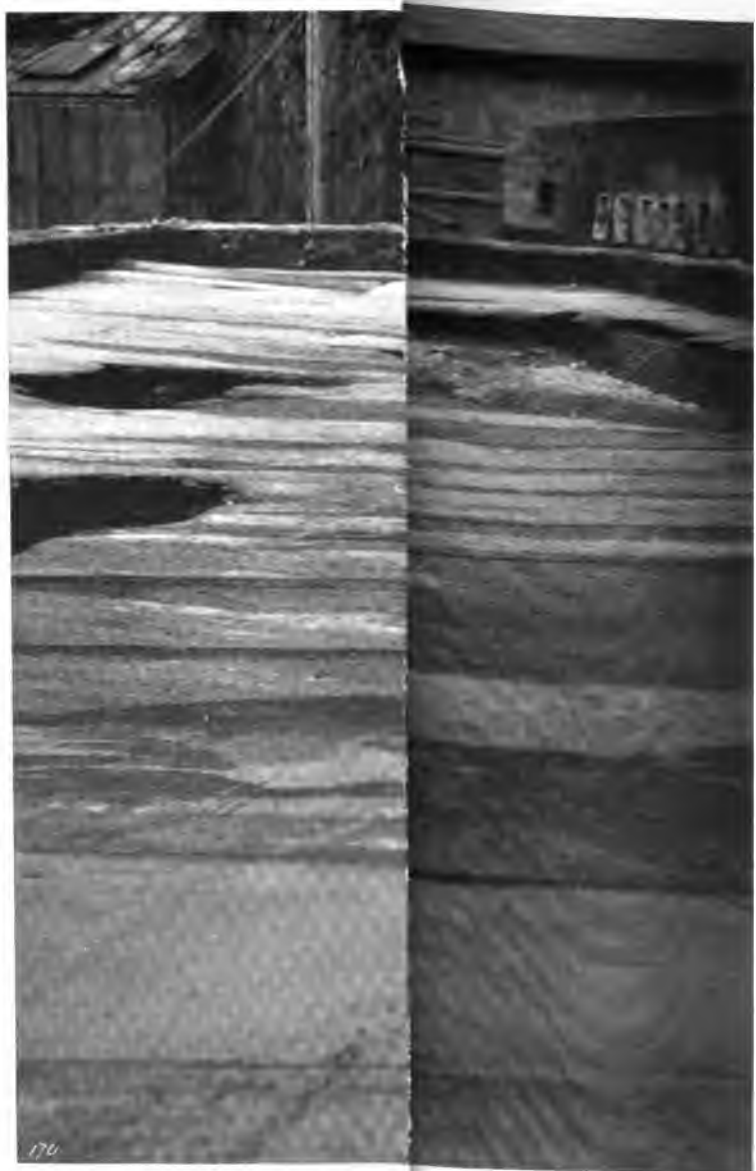
At 4.53 p.m. the same thermometer registered 98°. The blister on ceiling referred to at 4.15 p.m., extending towards S.W. corner, and the plaster dropping off, exposing the metal lathing.

At 4.55 p.m. the external thermometer registered 120°.

At 5.20 p.m. the external thermometer registered 160°.

At 5.37 p.m. the gas was turned off.

At 5.39 water was applied to the soffit of floor through a half-inch jet at about 20 lbs. pressure. The effect of this was to wash the plaster off the ceiling where it was struck by the water, exposing the metal lathing.


170

At 5.41 p.m. the water was shut off and the test concluded.

*Note.*—The floor at the conclusion of the test showed little, if any, deflection.

## OBSERVATIONS AFTER TEST.

*(See Figs. 6, 7 and 8).*

On March 29th the load was removed. It was found that the wooden joists had ignited, and the floor boards were burnt through in patches (see Fig. 6).

*Note.*—The fire had been smouldering all night, and water was applied to extinguish it.

The photographs shown in Figs. 6 to 8 were taken.

On the same day at 4 p.m. some of the floor boards were removed and the wooden joists examined.

It was found that all the joists had been more or less damaged by the fire smouldering all night, portions of them were quite consumed, leaving the matrix only in the concrete.

The least damaged of the 9 joists forming the floor was the centre one, and this was intact but for a piece about 12 inches long and 5 inches deep, which was consumed about 15 inches distant from south end.

The floor had deflected $2\frac{3}{4}$ inches.

On examining the soffit it was found that all the plaster had fallen, with the exception of about half-a-yard at the S.W. corner.

The metal lathing was exposed and a patch about 12 inches by 6 inches by the N.W. corner was found to be partly fused.

There were straight joints in the lower 2 inches of concrete in line with the vertical pieces of expanded

metal fixed to the sides of the joists, to which the horizontal lathing was hung. The two inches of concrete, formed of dry ashes and Portland cement, was loose and disintegrated, but the remainder of the concrete was sound and unaffected by the fire.

## GENERAL ARRANGEMENTS.

The test was carried out in accordance with the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee, comprising:—

Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. Max Clarke, A.R.I.B.A.
Mr. Matt. Garbutt, A.R.I.B.A., A.M. Inst. C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended the instrument room.

The Council was represented by:—
Sir John Taylor, K.C.B., H.M. (Office of Works).
Mr. Arthur Cates, F.R.I.B.A. (late Surveyor Crown Estates).

The Executive was represented by:—
Mr. Edwin O. Sachs (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E.
Mr. F. Hammond, F.R.I.B.A., District Surveyor E. Hampstead.

The Members' Testing Sub-Committee was represented by Mr. G. E. Monckton, M.A.

The Commercial Section was represented by:—
Mr. F. R. Farrow, F.R.I.B.A. (Chairman).
Lieut.-Col. J. Colquhoun (London Non-Flammable Wood Co.).

Mr. J. F. Golding (The Expanded Metal Co,).
Mr. J. D. O'Brien (The Columbian Fireproofing Co.).
Mr. J. A. King (Messrs. J. A. King & Co.).
Mr. H. Salmon (The Expanded Metal Co.).
Mr. H. B. Tarry (The British Uralite Co.).
Mr. D. R. Ratcliffe (The Ratner Safe Co.).
Mr. A Williams (G. A. Williams & Son).
Mr. Gilbert Davenport (The Expanded Metal Co.).

The general body of members was represented by:—

Mr. J. F. Dyer, Vice-Pres. National Fire Brigades' Union.
Mr. F. S. Capon, Architect's Dept., L.C.C.
Mr. Arthur Crow, A.R.I.B.A. (District Surveyor, Whitechapel).
Mr. Bernard Dicksee, A.R.I.B.A. (District Surveyor, E. Newington).
Mr. E. Dru-Drury, F.R.I.B.A. (District Surveyor, St. Margaret's).
Mr. W. Grellier, F.R.I.B.A. (District Surveyor, Clapham).
Mr. F. W. Hamilton, A.R.I.B.A. (District Surveyor, N. Fulham).
Mr. E. R. Hewitt, A.R.I.B.A. (District Surveyor, St. Saviour's).
Mr. Geo. McDonell, A.R.I.B.A. (District Surveyor, Islington, S.W.).
Mr. Hugh McLachlan, A.R.I.B.A. (District Surveyor, West Division, City of London).
Mr. R. Notley, F.R.I.B.A., F.S.I. (District Surveyor, Bethnal Green).
Mr. J. P. Norrington, A.M. Inst. C.E. (Surveyor, Lambeth).
Mr. W. Weaver, M. Inst. C.E. (Surveyor, Kensington).
Mr. F. E. Eiloart.
Mr. A. Fernhead.

The following visitors attended by special invitation of the Executive :—

Mr. A. E. Buthrey, Mr. A. Howard Colls, Mr. T. Costigan (Sec. Builders' Institute), Mr. Coward, Mr. Howard Dru-Drury, Mr. Friswell, Mr. T. E. Gatehouse, F.R.S. Ed., Mr. Hamsley, Mr. E. R. Marsland, Mr. W. G. Perkins, Mr. H. Rogers, Mr. E. S. Young.

Signed,

*For the Sub-Committee conducting Test :*

ELLIS MARSLAND (*Directing Member*).

*For the Commercial Section* :

FREDERIC R. FARROW.

*For the Executive* :

EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR,
(*Assist. Secretary.*)

*Date—May 1st*, 1900.

*Fig.* 8. View Showing Condition of Ceiling after First Test.

*blications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No.* 56.

*dited by Edwin O. Sachs.*

# FIRE TESTS WITH FLOORS.

---

## A FLOOR

BY

## The Mural and Decorations Syndicate, Ltd.,

LONDON.

---

## The Committee's Report.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
*(Founded 1897—Incorporated 1899)*,
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence nett.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superindending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32-oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Maghogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete.

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past President. Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL. F.R.I.B.A., F.S.I., late Superintending Architect, London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division, City of London; Past Pres., District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.
SIR DOUGLAS FOX, President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B, F.R.S.
A. B. MACDONALD M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C E, Past President, Institute of Electrical Engineers.
THE RIGHT HON. THE EARL OF STRADBROKE.
ALEXANDER STENNING. F.R.I.B.A.
SIR ARTHUR SULLIVAN, Mus. Doc.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS. Past President, The Surveyors' Institution.

*Executive:*
MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
MATT. GARBUTT, A.M.Inst.C.E., A.R I.B.A.
T. E. GATEHOUSE, F.R.S.Ed., A.M.Inst.C.E.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc. C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Archt., F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C E.. M.I.Mech.E., Past President, Municipal Electrical Association.

*The Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*
LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*
T. KISSACK.

*Hon. Secretary:*
GEORGE E. MONCKTON, M.A.

*Offices:*
1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

With this report the Committee presents the result of an investigation which had the novel and interesting feature of having been conducted in such a manner as to comprise, firstly an ordinary Test, and then a Continuation Test.

To Insurance men, in particular, the value of this Continuation Test will be apparent, inasmuch as such a Continuation Test shows what the nature of a material or system of construction may be, after one ordeal has already been passed through and the repairs (if any) have been completed according to the ordinary methods.

We here, in fact, have a case where the maker, having submitted his goods to a test, has sufficient confidence that they will withstand a second ordeal after he has executed such ordinary and decorative repairs as would be required to reinstate a building in which an outbreak has occurred.

This is certainly a more exhaustive method of investigation than has as yet been practised in research work of this description, and I am sure that it calls for the special attention of all interested in questions of fire-irresistance. I have also little doubt that the example set will soon be followed by other makers who have the insurance aspect of their systems in view.

EDWIN O. SACHS.

*December 31st*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

(*MEMORANDUM.*)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORTS

OF THE

# British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TESTS NOS. 27 & 28.—JULY 11th & 25th, 1900.

## A FLOOR AND CEILING

ERECTED BY

## The Mural and Decorations Syndicate, Ltd., LONDON.

### OBJECT OF TEST.

To record the effect of a fire of one hour and a quarter, commencing at a temperature of 500° Fahr. and increasing to 2,000° Fahr., followed by the application of water from below for two minutes.

*Note.*—The area of the floor under investigation was 100 ft. superficial in the clear (10 ft. by 10 ft.). The floor was to be loaded with 1½ cwt. per square foot distributed.

The time allowed for the construction and drying was six weeks (summer).

### SUMMARY OF EFFECT.

In five minutes most of the setting coat of plaster had fallen off.

Various cracks developed in the plaster of ceiling during the test, but no portion of the rendering fell.

On the application of water the plaster fell off where struck by the jet, exposing the terra cotta lathing. The floor and lathing remained intact and unaffected by fire.

*Special Note.*—After the test had concluded, it was determined that the ceiling should be replastered and the test renewed for one hour on a subsequent date, and on

the conclusion of this continuation test practically the same results were again observed. (*See page* 18).

## DESCRIPTION OF TESTING PLANT.

*(See Figs. 1 to 4.)*

The testing chamber was located at the Committee's Testing Station, and was known as "No. 5 Hut."

The hut was constructed of stock bricks, as shown, with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the floor tested was 7 ft. 5 in. above the pavement of the chamber.

The door-opening on the north side measured 2 ft. by 6 ft. 6 in., but this opening was bricked up before the test.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, each 10 ft. by 3 ft., as shown.

Two Roberts-Austen pyrometers were used for recording the temperatures, the first to take a continuous record from point No. 5, and the second to take four observation records from points Nos. 1, 2, 3, 4.

The load was of bricks distributed evenly on the surface of the floor.

There were two observation holes in the south wall, one in the east wall, one in the west wall, and one in the north wall; the last three were each covered with an iron shutter.

Four vertical staffs were placed on the roof, and observations of these staffs were made with a dummy level standing on the roof of an adjoining hut.

The draught holes were in the east and west walls.

The photographs were partly taken by daylight and partly by flash-light.

The stream of water was applied by a branch with ½-inch nozzle, supplied from a manual fire engine equipped with a pressure gauge.

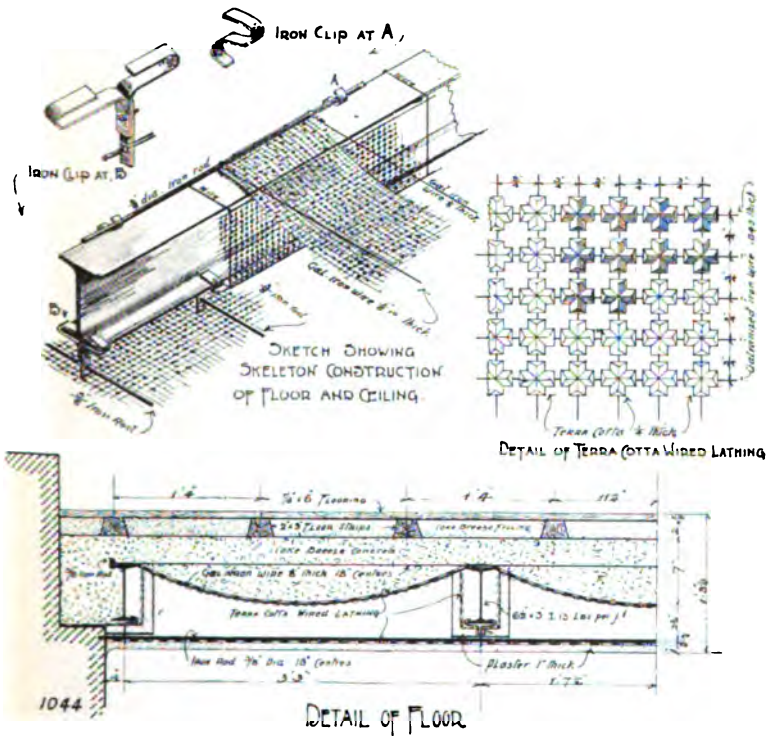
1045.

## CONSTRUCTION OF FLOOR.

(*See Figs.* 1 *to* 7.)

The construction of the floor, illustrated in Figs. 1 to 7, was as follows:—

On May 30th, four joists of Belgian steel, 6½ in. by 3 in. and weighing 13 lbs. per foot, were put into position on the 4½ in. off-set of the north and south walls and


Iron Clip at A
Iron Clip at B
Sketch Showing Skeleton Construction of Floor and Ceiling
Detail of Terra Cotta Wired Lathing
1044

Detail of Floor

(*Figs.* 5, 6 *and* 7.)

spaced 3 ft. 3 in. centers. On top of the steel joists and spaced 1 ft. 6 in. centers, galvanized iron wire ⅛ in. thick was stretched from joist to joist and hooked on to the top flanges. On the top flange of the two end joists and running the whole length of same, iron rods ⅜ in. diameter were laid and secured thereto with S iron clips, ½ in. wide, 1/16 in. thick. Attached to these rods and covering the

entire area of floor terra cotta wired lathing was laid. and was depressed 4 in. between each joist, forming an inverted arch.

Galvanized iron wire, $\frac{1}{8}$ in. thick and spaced 18 in. apart, was stretched across from the east to the west joist above the wired lathing. Iron hooks, 5 in. long, were driven into the walls and the two end joists were secured thereto with galvanized iron wire, $\frac{1}{8}$ in. thick.

The joists were then encased with terra cotta wired lathing secured to a skeleton frame of galvanized iron wire, $\frac{1}{8}$ in. thick, and when put into position galvanized iron wire, $\frac{1}{8}$ in. thick, was carried round both the casing and the joists and thoroughly secured.

On June 2nd the concrete was put in. This was made in the proportion of four parts of coke breeze to one part of Portland cement, mixed three times dry and four times wet, 38·75 gallons of water being used to each $\frac{1}{2}$-cubic yard of material.

The concrete was carried to the floor in buckets and laid on the top of the terra cotta wired lathing, which formed the centering, and was levelled with a trowel only.

*Note.*—The coke breeze was obtained at the Kensal Green Gas Works and was dry before being used.

The Portland cement was of English manufacture. bought in the open market, and was not selected.

On June 5th the sides and bottom flanges of steel joists, which had been covered with terra cotta wired lathing. were plastered 1 in. thick with material composed of three parts of screened coke breeze to one part of Portland cement with a small quantity of coarse stuff (lime, sand and hair) added. Wrought iron clips for the support of ceiling were attached to the lower flange of steel joists, they were 1 in. wide, $\frac{3}{32}$ in. thick, and made as shown on page 9.

Iron rods, $\frac{3}{8}$ in. diameter and spaced 15 in. apart, were used for ceiling, and the terra cotta wired lathing forming the ceiling was secured thereto. Underneath the lathing, galvanized iron wire, $\frac{1}{8}$ in. thick and spaced 10 in. apart and running across the ceiling in both

directions. was put up and secured to hooks driven into the walls and also secured to the lathing with thin galvanized iron wire.

The terra cotta wired lathing was $\frac{3}{4}$-in. mesh, the wire being ·04 in. diameter; and at the junctions of the horizontal and vertical wires terra cotta connections, $\frac{1}{4}$ in. thick, were burnt on, firmly securing the junctions of the several wires, see page 9.

On June 8th 2 in. by 3 in. deal floor strips, spaced 16 in. centres. were laid on top of the concrete forming the floor, and the space between filled in flush with concrete made with six parts of coke breeze to one part of Portland cement and mixed in a similar way to the other concrete.

On June 8th the first or rendering coat of coarse stuff was put on the ceiling. This was obtained from a local contractor. and was made with lime, sand and hair, and before use was gauged with Mural and Decoration Syndicate's slow-setting plaster of Paris.

On June 9th the floating coat was put on. This was similar to the first coat.

On June 11th the setting coat was put on. This was made with eight parts of lime-putty to one part of Mural and Decoration Syndicate's slow-setting plaster of Paris.

On July 8th $\frac{7}{8}$ in. by 6 in. yellow flooring was laid over the entire surface and nailed to the floor strips with floor brads.

The floor was covered with a tarpaulin, which was taken off when the weather permitted; it was finally removed on the morning of the test.

For June the readings were:—Total rainfall, 2·26 in., with a maximum of ·39 in. (June 25). The maximum temperature was 90·1 Fahr. (June 11); minimum, 45·8 Fahr. (June 5).

## PREPARATIONS FOR TEST.

On July 9th, 10th and 11th, the floor was loaded with bricks, weighing 13,600 lbs., equal to a distributed load of $1\frac{1}{2}$ cwt. per square foot over an area of 9 ft. by 9 ft.

## THE TEST.

On July 11th, 1900, the test was undertaken. The following is a log of the test :—

At 3 p.m. on July 11th, the Meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :—

State of weather, clear and fine; Wind, N.W.; Rain, none; Barometer, 30·07 in.; Attached Thermometer, 72·4° Fahr.; Dry Bulb, 83° Fahr.; Wet Bulb, 65·5° Fahr.: Remarks, fine and close afternoon.

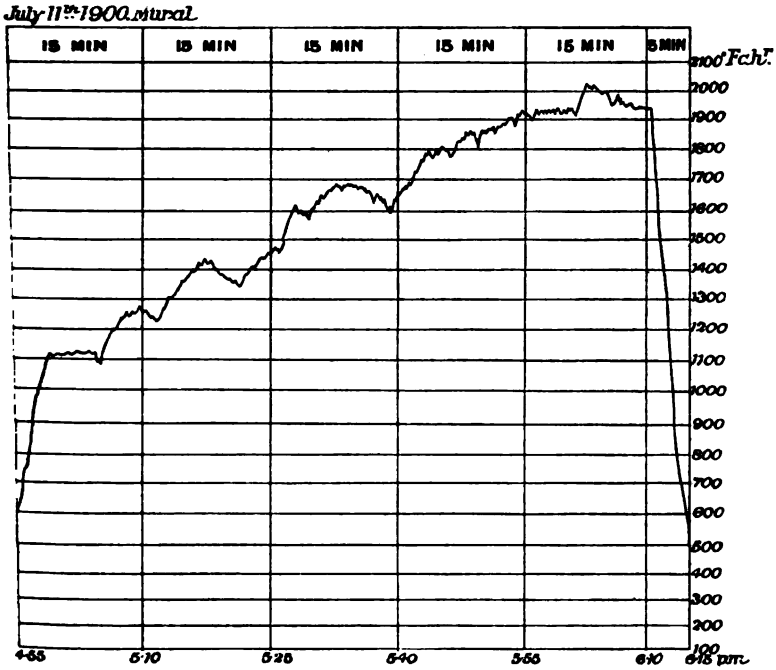
The table given below shows the temperatures taken from the four pyrometer observation points in the hut, as shown in the drawings as Nos. 1, 2, 3, 4.

OBSERVATIONS TAKEN AT POINTS NOS. 1. 2, 3 4.

*(From 5.0 p.m. to 6.15 p.m.)*

| TIME. | NO. 1. | NO. 2. | NO. 3. | NO. 4. |
|---|---|---|---|---|
| 5.0 p.m. | 800° F. | 560° F. | 1,100° F. | 580° F. |
| 5.5 ,, | 950° ,, | 600° ,, | 1,250° ,, | 875° ,, |
| 5.10 ,, | 1,140° ,, | 720° ,, | 1,400° ,, | 1,000° ,, |
| 5.15 ,, | 1,200° ,, | 810° ,, | 1,400° ,, | 1,110° ,, |
| 5.20 ,, | 1,350° ,, | 940° ,, | 1,510° ,, | 1,200° ,, |
| 5.25 ,, | 1,360° ,, | 1,000° ,, | 1,500° ,, | 1,210° ,, |
| 5.30 ,, | 1,500° ,, | 1,100° ,, | 1,650° ,, | 1,280° ,, |
| 5.35 ,, | 1,600° ,, | 1,250° ,, | 1,750° ,, | 1,360° ,, |
| 5.40 ,, | 1,600° ,, | 1,300° ,, | 1,690° ,, | 1,400° ,, |
| 5.45 ,, | 1,700° ,, | 1,380° ,, | 1,850° ,, | 1,400° ,, |
| 5.50 ,, | 1,780° ,, | 1,480° ,, | 1,910° ,, | 1,450° ,, |
| 5.55 ,, | 1,800° ,, | 1,540° ,, | 1,950° ,, | 1,475° ,, |
| 6.0 ,, | 1,810° ,, | 1,600° ,, | 1,980° ,, | 1,510° ,, |
| 6.5 ,, | 1,900° ,, | 1,680° ,, | 2,050° ,, | 1,520° ,, |
| 6.10 ,, | 1,820° ,, | 1,650° ,, | 1,900° ,, | 1,550° ,, |
| 6.15 ,, | 700° ,, | 1,050° ,, | 920° ,, | 410° ,, |

The temperature as shown by the automatic record, point 5, is given below.




At 4.55 p.m. the gas was lighted.

At 4.57 p.m. the setting coat of the ceiling was falling off.

At 5.0 p.m. most of the setting coat had fallen off.

From 5.34 p.m. to 6.0 p.m. various cracks developed over the surface of the ceiling, and the ceiling bulged to some slight extent, but no plaster fell beyond the setting coat mentioned above.

At 6.10 p.m. the gas was turned off.

At 6.11 p.m. water was applied through a ½-inch nozzle, the pressure being 25 lbs. at the pump.

At 6.13 p.m. the water was turned off.

On the application of water, the plaster to the ceiling fell where struck by the jet, exposing the terra cotta lathing. No other effects of the water were apparent.

The test was then concluded.

Observations were made from time to time to test any deflection of the floor. No deflection was observed.

## OBSERVATIONS AFTER TEST.

(*See Fig.* 8).

On July 12th the photograph shown in Fig. 8 was taken.

On July 12th the floor and ceiling were examined, and the following observations made :—

There was practically none of the setting coat of plaster remaining in position. Of the floating coat, about half remained in position, but was disintegrated. Of the rendering, about two yards had been displaced by the jet of water, exposing the terra cotta lathing; the portion remaining up was disintegrated.

No other effects from the fire and water were apparent. The floor was intact and the fire had not passed through it. The floor had not deflected.

*Special Note.*—After the first test had concluded, it was determined that the ceiling should be replastered and the test renewed for one hour at a subsequent date. (*See page* 16.)

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a sub-committee of the Executive, comprising :—

Mr. Ellis Marsland (Directing Member).
Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.
Mr. Chas. E. Goad, M. Am. Soc. C.E., M. Can. Soc. C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by :—
Mr. Arthur Cates, F.R.I.B.A., F.S.I., late Surveyor Crown Estates.

The Executive was represented by :—
Mr. Edwin O. Sachs (Chairman).

The Commercial Section was represented by :—
Mr. Frederic R. Farrow, F.R.I.B.A.

The Members' Testing Sub-Committee was represented by :—
Mr. George E. Monckton, M.A.

The general body of members was represented by :—
Mr. F. Sizer Capon (Architects' Department, L.C.C.).

The Mural and Decorations Syndicate, Ltd., was represented by :—
Mr. John Burgess (Secretary), Mr. C. Petri, and Sir George Thomas, Bart. (Directors).

The following visitors attended by special invitation of the Executive :—
Mr. H. A. Cheers, Mr. W. Fiddiman, Mr. E. J. A. Fulkes, Lieut. P. S Grieg, R.E., Mr. G. F. Harrington, Mr. W. Hiyne, Mr. J. Hurles, Mr. R. Morphew, Mr. E. Robins, Mr. P. Simpson, Mr. A. W. Smith.

Signed,

*For the Sub-Committee conducting the Test:*

ELLIS MARSLAND *(Directing Member).*

*For the Commercial Section:*

FREDERIC R. FARROW.

*For the Executive:*

EDWIN O. SACHS.

Published by the Committee as directed by the Executive.

H. S. TAYLOR *(Assist.-Secretary).*

*Date—November 10th, 1900.*

Verified a true copy of the report, ordered to be published.

WILLIAMSON, HILL & CO. *(Solicitors).*

*Date—December 31st, 1900.*

---

## CONTINUATION TEST.

### DESCRIPTION OF REINSTATEMENT.

After the first test the load on floor was partly removed.

On July 14th, 1900, the remaining plaster on the ceiling from the former test was removed and the first coat of plaster was put on; this consisted of coarse stuff, supplied by a local contractor, mixed with the Mural and Decoration Syndicate's slow-setting plaster of Paris in the proportion of three to one.

On July 16th the second coat was put on and was of the same materials and proportions as the first coat. The setting coat of putty and plaster of Paris was the same as in the previous test.

On July 19th cracks appeared on the surface of the ceiling; they were cut out and made good the same day.

On July 23rd a fire was lighted in the hut and kept in for two days.

For July the readings were:—Total rainfall, 1·50 in., with a maximum of ·58 in. (July 27). The maximum temperature was 95·2° Fahr. (July 16); minimum, 44·5° Fahr. (July 8).

to

ng

ons
as

ne;
ur.;
ks,

ken
, as

F.
"
"
"
"
"
"
"
"
"
"
"
"

*Fig. 9.* View Showing Condition of Ceiling after the Second Test.

## PREPARATIONS FOR TEST.

On July 23rd and 24th the floor was reloaded up to 1½ cwt. per foot super.

## THE TEST.

On July 25th the test was undertaken. The following is a log of the test:—

At 3 p.m. on July 25th the Meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:—

State of weather, cloudy; Wind, S.W.; Rain, none; Barometer, 29·90 in.; Attached Thermometer, 83° Fahr.; Dry Bulb, 90° Fahr.; Wet Bulb, 73° Fahr.; Remarks, very hot.

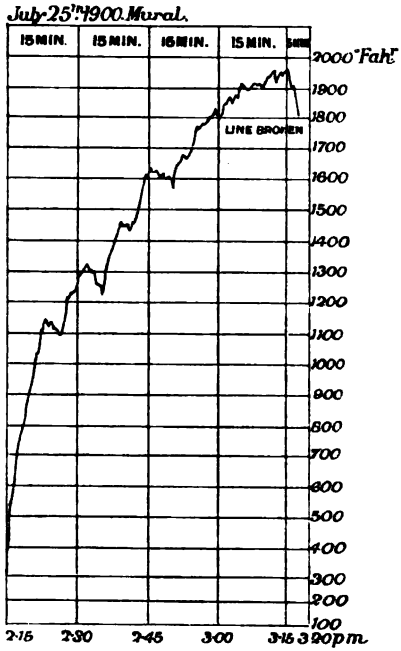
The table given below shows the temperatures taken from the four pyrometer observation points in the hut, as shown in the drawings as Nos. 1, 2, 3, 4.

OBSERVATIONS TAKEN AT POINTS, 1, 2, 3, 4.

(*From* 2.17 *p.m. to* 3.15 *p.m.*)

| TIME. | No. 1. | No. 2. | No. 3. | No. 4. |
|---|---|---|---|---|
| 2.17 p.m. | 250° F. | 250° F. | 350° F. | 300° F. |
| 2.20 „ | 600° „ | 580° „ | 750° „ | 700° „ |
| 2.25 „ | 900° „ | 860° „ | 1,075° „ | 1,100° „ |
| 2.30 „ | 980° „ | 930° „ | 1,120° „ | 1,130° „ |
| 2.35 „ | 1,130° „ | 1,050° „ | 1,200° „ | 1,210° „ |
| 2.40 „ | 1,300° „ | 1,200° „ | 1,350° „ | 1,350° „ |
| 2.45 „ | 1,400° „ | 1,300° „ | 1,405° „ | 1,450° „ |
| 2.50 „ | 1,475° „ | 1,400° „ | 1,480° „ | 1,480° „ |
| 2.55 „ | 1,515° „ | 1,450° „ | 1,520° „ | 1,550° „ |
| 3.0 „ | 1,680° „ | 1,600° „ | 1,600° „ | 1,680° „ |
| 3.5 „ | 1,700° „ | 1,650° „ | 1,650° „ | 1,700° „ |
| 3.10 „ | 1,750° „ | 1,700° „ | 1,750° „ | 1,800° „ |
| 3.15 „ | 1,820° „ | 1,750° „ | 1,770° „ | 1,850° „ |

The temperature as shown by the automatic record point 5, is given below:




At 2.16 p.m. the gas was lighted.

At 2.35 p.m. some of the setting coat had fallen off.

At 2.54 p.m. the setting and floating coat had fallen off a patch of about 2 ft. 6 in. diameter.

At 3.2 p.m. a crack about $\frac{3}{16}$ in. wide appeared in the ceiling near the centre of east wall.

At 3.9 p.m. the crack last mentioned had widened.

At 3.17 p.m. the gas was turned off.

At 3.18 p.m. water was applied, when some portions of the ceiling fell where struck by the jet.

The test then concluded.

## OBSERVATIONS AFTER TEST.

(*Fig.* 8.)

On July 26th the photograph shown in Fig. 8 was taken.

On July 27th and 31st the floor and ceiling were examined and the following observations made:—

The surface of the ceiling for about two yards had half the thickness of the plaster fallen.

About two feet superficial of the wired lathing was bare.

About two yards superficial of the floating and setting coats had fallen.

About four yards of the setting coat had fallen.

About four yards superficial of the setting coat was in position, but cracked all over and disintegrated.

No other effects of the fire were apparent.

On removing a portion of the ceiling and lathing, the covering to the iron joists was found intact, and the soffit of the floor was unaffected either by the heat or water.

The floor boards were not discoloured.

The fire had not passed through the floor.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising:—

Mr. F. Hammond, F.R.I.B.A. (Directing Member).
Mr. Max Clarke, A.R.I.B.A.
Mr. T. E. Gatehouse, F.R.S.Ed.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by :—

Mr. Arthur Cates, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates.

Major-General Festing of the South Kensington Museum.

The Executive was represented by :—

Mr. Edwin O. Sachs (Chairman).

Mr. Ellis Marsland.

The general body of members was represented by :—

Mr. William Abbott, F.S.I.

Mr. T. Lewis Banks, F.R.I.B.A.

Mr. F. Sizer Capon (Architects' Department, L.C.C.

Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington

Mr. Augustus Frere, F.R.I.B.A.

Mr. F. W. Hamilton, A.R.I.B.A., District Surveyor, North Fulham.

Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark.

Mr. W. Hewson Lees, A.R.I.B.A., District Surveyor. South-East Deptford.

Mr. N. B. McDermott, F.S.I. (late of War Office).

Mr. R. P. Notley, F.R.I.B.A., District Surveyor. Bethnal Green.

Mr. L. Pyke, A.M.Inst.C.E.

Mr. H. H. Ray.

Mr. James Sheppard.

Mr. Sidney R. J. Smith, F.R.I.B.A., F.S.A.

Mr. W. Waine.

Mr. F. Wallen, F.R.I.B.A., District Surveyor, West St. Pancras.

Mr. T. Wilkins, F.G.S.

Mr. Oswald C. Wylson, F.R.I.B.A.

The Mural and Decorations Syndicate was represented by :—

Mr. J. Burgess (Secretary), Mr. C. Petri, and Sir George Thomas, Bart. (Directors).

The following visitors attended by special invitation of the Executive :—

Mr. C. C. Absolom, Mr. L. Azario, Mr. Paul Blaschke, Mr. Clarence Coggin, Mr. Roy Collier, Mr. W. B. Downs, Mr. Albert Gray, Mr. J. Halford, Mr. J. Heyne, Mr. Septimus Marsland, Mr. E. Robins, Mr. R. Robertson, Mr. W. F. Sherman, Mr. A. W. Smith, and Mr. F. G. Minter.

Signed,

*For the Sub-Committee conducting the Test*:
F. HAMMOND *(Directing Member)*.

*For the Commercial Section*:
FREDERIC R. FARROW.

*For the Executive*:
EDWIN O. SACHS.

Published by the Committee, as directed by the Executive.
H. S. TAYLOR
*(Assist.-Secretary)*.
*Date*—10*th December*, 1900.

Verified a true copy of the report ordered to be published.
WILLIAMSON, HILL & CO.
*(Solicitors)*.
*Date*—31*st December*, 1900.

E SIDE).

*ions of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 57.*

*by Edwin O. Sachs.*

# FIRE TESTS
WITH
# TREATED WOOD.

A MATCH-BOARDED PARTITION OF DEAL, painted with Oil Colour.

A MATCH-BOARDED PARTITION OF "NON-FLAMMABLE" DEAL, painted with "Non-Flammable" Paint.

BY THE

London Non-Flammable Wood Co., Ltd., London.

THE COMMITTEE'S REPORT.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
*(Founded, 1897—Incorporated, 1899).*
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence nett.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

No. 1.—WHAT IS FIRE PROTECTION?
No. 2.—AMERICAN OPINIONS ON FIRE PROTECTION.
No. 3.—THE PARIS BAZAAR FIRE.
No. 4.—THEATRE EXITS.
No. 5.—THE NEW YORK FIRE DEPARTMENT.
No. 6.—COTTON FIRES AND COTTON BALES.
No. 7.—"FIRE-RESISTING" FLOORS USED IN LONDON.
No. 8.—FIRE SERVICE IN FACTORIES, WORKS, &c.
No. 9.—LESSONS FROM FIRE AND PANIC.
No. 10.—HOW TO BUILD "FIRE-PROOF."
No. 11.—THE TESTS WITH UNPROTECTED COLUMNS.
No. 12.—THE EFFECT OF FIRE.
No. 13.—THE TESTING STATION OF THE B.F.P.C.
No. 14.—OFFICIAL FIRE TESTS WITH FLOORS (No. 1).
No. 15.—CONFLAGRATIONS DURING THE LAST TEN YEARS.
No. 16.—EXPERIMENTAL FIRE TESTS WITH FLOORS (A).
No. 17.—THE TALL BUILDING UNDER TEST OF FIRE.
No. 18.—EXPERIMENTAL FIRE TESTS WITH FLOORS (B).
No. 19.—OFFICIAL FIRE TESTS WITH CEILINGS (No. 2).
No. 20.—OFFICIAL FIRE TESTS WITH GLAZING (No. 3).
No. 21.—EXPERIMENTAL FIRE TESTS WITH FLOORS (C).
No. 22.—EXPERIMENTAL FIRE TESTS WITH PARTITIONS (D & E)
No. 23.—OFFICIAL FIRE TESTS WITH FLOORS (No. 4).
No. 24.—EXPERIMENTAL FIRE TESTS WITH DOORS (G, H, AND I).
No. 25.—EXPERIMENTAL FIRE TESTS WITH DOORS (K AND L).
No. 26.—EXPERIMENTAL FIRE TESTS WITH DOORS (M AND N).
No. 27.—OFFICIAL FIRE TESTS WITH PARTITIONS (No. 7).
No. 28.—OFFICIAL FIRE TESTS WITH CEILINGS (No. 8).
No. 29.—OFFICIAL FIRE TESTS WITH GLASS (No. 5).
No. 30.—OFFICIAL FIRE TESTS WITH GLASS (No. 6).
No. 31.—OFFICIAL FIRE TESTS WITH GLASS (No. 11).
No. 32.—OFFICIAL FIRE TESTS WITH GLASS (No. 12).
No. 33.—EXPERIMENTAL PLAIN GLASS TESTS (O, P AND Q).
No. 34.—EXPERIMENTAL FIRE TESTS WITH FLOORS (R).
No. 35.—EXPERIMENTAL FIRE TESTS WITH DOORS (S AND T).
No. 36.—OFFICIAL FIRE TESTS WITH TREATED WOOD (No. 9).

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*

EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington, Museum.
SIR DOUGLAS FOX, President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
THE RIGHT HON. THE EARL OF STRADBROKE.
ALEXANDER STENNING, F.R.I.B.A.
SIR ARTHUR SULLIVAN, Mus. Doc.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C.E., M.I.Mech.E., Past President, Municipal Electrical Association.

*Chairman of the Commercial Section:*

FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors*

WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*

JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*

LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*

T. KISSACK.

*Hon. Secretary:*

GEORGE E. MONCKTON M.A.

*Offices:*

1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

This Report of the Committee deals with the comparative results of a fire test applied to (*a*) an ordinary wood and match-boarded partition painted in oil colour, and (*b*) a partition built up in every detail similar thereto, but that the timber and wood prior to delivery were subjected to a chemical treatment. Moreover, this partition was painted with what is termed "non-flammable" paint, and the muslin hangings used were said to be dipped in a "non-flammable" solution.

F. HAMMOND.

LONDON,
*June 30th*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

(*MEMORANDUM.*)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

VIEW AFTER TEST.

"NON-FLAMMABLE WOOD" PARTITION. *Figs. 9 and 10.* VIEWS BEFORE AND AFTER TEST (FROM INSIDE).

ORDINARY WOOD PARTITION. *Figs. 7 and 8.* VIEWS TAKEN BEFORE AND AFTER

# OFFICIAL REPORTS

OF THE

# British Fire Prevention Committee.

[FOUNDED 1897.--INCORPORATED 1899.]

## FIRE TESTS No. 23 & 24.—MAY 2, 1900.

## (No. 23) A MATCH-BOARDED PARTITION OF DEAL PAINTED WITH OIL COLOUR.

## (No. 24) A MATCH-BOARDED PARTITION OF "NON-FLAMMABLE" DEAL PAINTED WITH "NON-FLAMMABLE" PAINT.

BY THE

LONDON NON-FLAMMABLE WOOD CO., LTD., LONDON.

### OBJECT OF TEST.

To record the effect of a fire upon *non-flammable* wood and *ordinary* wood respectively, when used for match-boarded partitions, and to particularly ascertain the difference, if any, as to the *spread of flame* in the wood when in contact with fire.

*Note.*—The application of flame to be from one side and one point at a temperature increasing to about 1000° Fahr., for a period of 45 minutes.

The partitions to be constructed of studs with match boarding each side and to have doors in them.

The partitions of *non-flammable* and *ordinary* wood to be respectively painted with one coat of *non-flammable* and one coat of *ordinary paint.*

On the side of the partitions opposite the fire-side, a floor, some furniture and hangings to be provided, and these adjuncts to be similarly *non-flammable* and *ordinary* respectively.

The test with both partitions to be conducted simultaneously and the conditions to be similar in every respect.

*Memo.*—The only difference observable in the two chambers was in the width of the boards. In No. 1 hut they were 7 in. wide; in No. 2 hut, 6½ in. wide.

## SUMMARY OF EFFECT.

### Ordinary Wood Partition.

In 2 minutes the boarding of ceiling in passage and partition had caught fire.

In 3 minutes smoke appeared in the interior of chamber.

In 10 minutes portions of the ceiling in passage fell in flakes.

In 15 minutes sparks appeared in the chamber over top of door.

In 16 minutes flame over top of door, which caught muslin hangings.

In 18 minutes tablecloth caught alight. Pyrometer recorded temperature to the interior of the chamber at 103 degrees and 160 degrees respectively.

In 19 minutes the boarding of ceiling in passage burnt through and falling in lengths.

In 20 minutes top board to partition next passage was burnt through.

In 22 minutes top part of door was mostly consumed.

In 26 minutes top of door inside the chamber was blazing freely.

In 30 minutes fire all along the top of the partition.

In 31½ minutes chair hangings caught alight, and the whole of the furniture began to burn.

In 32 minutes the interior of the chamber was well alight, everything blazing freely, the whole chamber being full of flame.

In 45 miuutes everything was consumed except the studs, which were blazing freely.

### Non-Flammable Wood Partition.

In 6 minutes signs of charring on boarding of ceiling over gas flame.

1032

These figures

In 17 minutes charred wood fell ½ in. thick from boarding of ceiling in passage.

In 20 minutes the chamber was full of smoke with offensive smell.

In 22 minutes large quantity of ceiling boarding in passage falling and beams of hut exposed to view.

In 27 minutes smoke inside chamber more intense, and large quantities issuing from draught holes.

In 29 minutes two lower boards of partition buckled near the gas flame.

In 39 minutes inside of chamber clearer, but objects therein hidden by smoke except table close to the observation hole.

In 40 minutes charred pieces falling from partition in passage.

In 45 minutes wood flaming in third board from bottom over third stud from East wall in passage.

At the close of the test the chamber was entered and the furniture, curtain, and antimacassars were intact and unaffected, except at the East end, where scorched by the burning of timber roof of hut.

The pyrometers recorded no temperatures to the interior of the chamber, inasmuch as at no time during the test did the temperature exceed 100° Fahr.

## DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1, 2, 3 *and* 4.)

The two huts used were located at the Committee's Testing Station, and were known as "Huts Nos. 1 and 2."

The huts were constructed, as shown, of stock bricks, with lime mortar, and each measured 10 ft. by 10 ft., internally.

The roof of each of the huts was 7 ft. 10 in. above the pavement, and was constructed of balk timber (not treated).

The door-openings were on the south side and measured 2 ft. 3 in. by 6 ft. 6 in.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The flame in each case was obtained by the admission of gas through a bunsen burner, the internal diameter of the burner being 4 in. There was one such burner in each hut.

A Roberts-Austen pyrometer was used for recording temperatures, 10 observation points in all being used, viz.: points No 5 and No. 10 being in the flame, No. 1 and No. 6 being in the side walls near the soffit of the hut over the flame, No. 4 and No. 9 being near the soffit at the west side of the passage, and No. 2, 3, 7 and 8 being near the soffit inside the chambers.

There were observation holes in the east and west walls of each hut, covered by moveable sheet-iron shutters.

The draught holes were in the east and west walls.

## CONSTRUCTION OF THE ORDINARY WOOD PARTITION IN HUT No. 1.

*(See Fig. 5.)*

The timber used in No. 1 Hut was stated to be DDD 1 in. by 7 in. yellow flooring, DDD 1 in. by 7 in. yellow flooring T G and B, and DDD 3 in. by 2 in. yellow T G and B. It was delivered at the Testing Station on April 23rd.

From April 24th to 26th the partition was erected.

The partition was constructed with 2 in. by 3 in. studs, 2 in. by 3 in. head, 2 in. by 3 in. sill, and 4 in. by 3 in. wrought doorposts and head with $\frac{3}{4}$ in. rebate.

The studs were nailed to the head and sill.

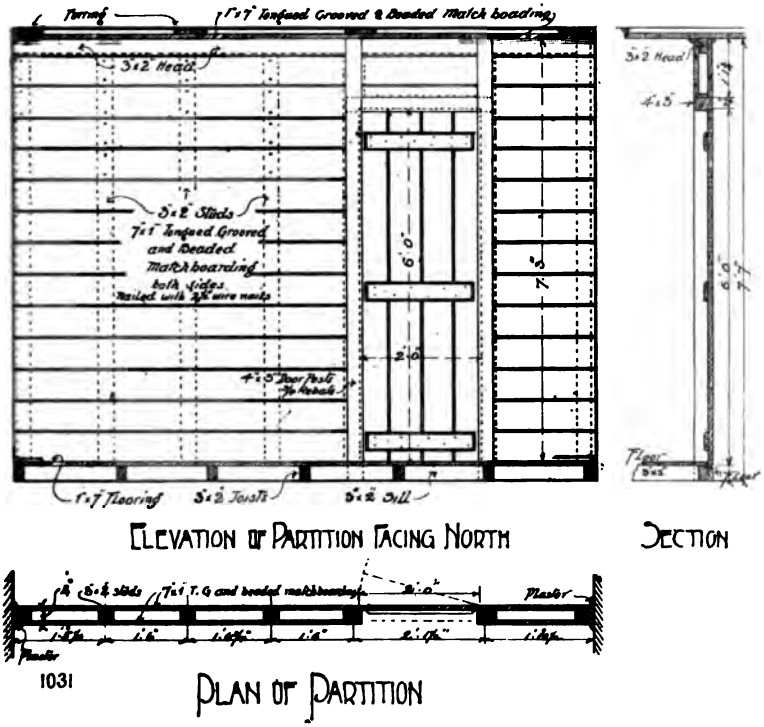
The studs against the walls were nailed with 5 in. wire nails.

The studs were covered with 1 in. by 7 in. beaded match-boarding nailed with $2\frac{1}{2}$ in. wire nails.

The door was of one thickness, 1 in. by 7 in. beaded match-boarding, with three 1 in. by $6\frac{1}{2}$ in. battens on the inside, nailed with $2\frac{1}{2}$ in. wire nails and clinched.

The doors were hung on two 16 in. wrought iron cross garnett hinges, each hinge secured with five $1\frac{1}{2}$ in. screws and two $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. bolts.

The door was fastened with two 6 in. barrel bolts. $1\frac{1}{8}$ in. moulding as angle bead was fixed all round the partition.




ARRANGEMENT OF PARTITIONS IN HUTS NO. 1 AND NO 2. *Fig.* 5.

On April 27th all the woodwork was painted one coat with oil and lead paint.

A coke fire was lighted in the hut on May 1st at 1 o'clock and kept in until 3 o'clock the same day.

NOTE.—The ceiling of passage outside the partition and inside the chamber for a distance of 1 ft. 2 in. was firred down 1 in. from the timber ceiling of the hut, the

firring strips running north and south, the ceiling under test being 5 ft. wide measured from the south wall and 10 ft. long, and was made with 1 in. by 7 in. beaded matchboarding, nailed with 3 in. and 5 in. wire nails.

A floor in the chamber was made with 2 in. by 3 in. joists laid on the floor of the hut and covered with 1 in. by 7 in. flooring nailed with 2½ in. wire nails.

Inside the Testing Chamber were placed a yellow deal table, two chairs and a small chest, and all were stained with one coat of ordinary stain.

Muslin curtains were hung over the door and along the partition.

Antimacassars were placed over the backs of chairs and a cloth on the table.

*Note.*—A tarpaulin was kept over the hut continuously until the morning of the test, when it was removed.

## CONSTRUCTION OF THE NON-FLAMMABLE WOOD PARTITION IN HUT No. 2.

The wood, studs and boarding which had (as stated by the Non-Flammable Wood Company) been treated by their process at the London Non-Flammable Wood Co.'s Works at Fulham, were delivered at the Testing Station on April 26th and erected on that and the following day, the 27th. The wood had been painted with one coat of what was described as "non-flammable" paint before delivery.

The material used was stated by the Company to be of the following description :—

BSS.C., 1 in. by 6½ in. yellow T. G. and B., treated August, 1899.
DDD., 1 in. by 7 in. yellow flooring, treated May, 1899.
DDD., 3 in. by 2 in. yellow „ treated July, 1899.

The partition was constructed with 2 in. by 3 in. studs, 2 in. by 3 in. head, 2 in. by 3 in. sill, and 4 in. by 3 in. wrought doorposts and head with ¾ in. rebate.

The studs were nailed to the head and sill.

The studs against the walls were nailed with 5 in. wire nails.

The studs were covered with 1 in. by 6½ in. beaded matchboarding nailed with 2½ in. wire nails.

The door was of one thickness, 1 in. by 7 in., beaded matchboarding with three 1 in. by 6½ in. battens on the inside, nailed with 2½ in. wire nails and clinched.

The doors were hung on two 18 in. wrought iron cross garnett hinges, each hinge secured with five 1½ in. screws and two 2½ in. by ¼ in. bolts.

The door was fastened with two 6 in. barrel bolts; 1⅛ in. moulding as angle bead was fixed all round the partition.

On April 30th a coke fire was lighted in the hut at 3 o'clock, and kept in until 7 o'clock.

NOTE.—The ceiling of passage outside the partition and inside the chamber for a distance of 1 ft. 2 in. was firred down 1 in. from the permanent timber ceiling of the hut, the firring strips running north and south, the ceiling under test being 5 ft. wide measured from the south wall, and 10 ft. long, and was made with 1 in. by 7 in. beaded matchboarding, nailed with 3 in. and 5 in. wire nails.

A floor in the chamber was made with 2 in. by 3 in. joists laid on the floor of the hut, and covered with 1 in. by 7-in. flooring, nailed with 2½ in. wire nails.

Inside the Testing Chamber were placed a table, 2 chairs and a small chest, all of which were stated to be of yellow deal, and to have been treated with a non-flammable solution, and stained one coat of green stain.

Muslin curtains were hung over the door and along the partition. Antimacassars were placed over the backs of chairs and a cloth on the table.

All these articles were stated by the Non-Flammable Wood Co. to have been treated with a non-flammable solution.

*Note.*—A tarpaulin was kept over the hut continuously until the morning of the test, when it was removed.

## RECORD OF TEMPERATURE (POINTS NOS. 1 TO 10).

ORDINARY WOOD PARTITION. NON-FLAMMABLE WOOD PARTITION.

| TIME. | ON FIRE SIDE (IN PASSAGE). | | | INSIDE THE CHAMBER. | | ON FIRE SIDE (IN PASSAGE). | | | INSIDE THE CHAMBER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. 5 (Flame). | No. 1. | No. 4. | No. 2. | No. 3. | Nc. 10 (Flame). | No. 6. | No. 9. | No. 7. | No. 8. |
| | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. |
| 3.10 | 850° | 150° | ... | ... | ... | 850° | 200° | — | — | -- |
| 3.13 | 1120° | 1100° | 450° | ... | ... | 1340° | 750° | 110° | — | — |
| 3.16 | 1200° | 960° | 500° | ... | ... | 1400° | 1100° | 300° | — | — |
| 3.19 | 1310° | 1230° | 750° | ... | ... | 1405° | 950° | 350° | — | — |
| 3.22 | 1300° | 1060° | 750° | .. | ... | 1425° | 850° | 395° | — | — |
| 3.25 | 1500° | 1250° | 600° | ... | ... | 1230° | 730° | 360° | — | — |
| 3.28 | 1400° | 1300° | 1000° | 105° | 160° | 1420° | 800° | 400° | — | — |
| 3.31 | 1300° | 1230° | 1100° | 100° | 165° | 1500° | 1100° | 400° | — | — |
| 3.34 | 1550° | 1300° | 1100° | 150° | 200° | 1320° | 1000° | 400° | — | — |
| 3.37 | 1600° | 1700° | 1300° | 330° | 450° | 1350° | 1050° | 450° | — | - |
| 3.40 | 1575° | 1800° | 1250° | 450° | 670° | 1400° | 1100° | 400° | — | — |
| 3.43 | 1500° | 1750° | 1360° | 1100° | 1200° | 1450° | 1200° | 410° | — | — |
| 3.46 | 1500° | 1750° | 1550° | 1250° | 1350° | 1380° | 1100° | 300° | — | — |
| 3.49 | 1560° | 1800° | 1680° | 1700° | 1540° | 1520° | 1170° | 310° | — | — |
| 3.52 | 1500° | 1710° | 1740° | 1560° | 1500° | 1545° | 1280° | 430° | — | — |
| 3.55 | 1300° | 1500° | 1730° | 1400° | 1390° | 650° | 900° | 400° | — | — |

## THE TEST.

On Wednesday, May 2nd, 1900, the test was undertaken. The following is a log of the test:—

At 3 p.m. the meteorological observations, taken at the Royal Botanic Gardens, Regent's Park, read as follows:—"State of weather, cloudy; wind, S.W.; barometer, 29·95; attached thermometer, 61·5° Fahr.; dry bulb, 65° Fahr.; wet bulb, 52·5° Fahr. Remarks: Very fine afternoon."

At 3 p.m. the partitions were intact.

| ORDINARY WOOD PARTITION. | NON-FLAMMABLE WOOD PARTITION. |
|---|---|
| HUT No. 1. | HUT No. 2. |
| *Outside.* | *Outside.* |
| At 3.10 p.m. the gas was lighted. | At 3.10 p.m. the gas was lighted. |
| At 3.12 p.m. the ceiling in passage caught alight, and the boarding to partition on passage side, east corner. | |
| | At 3.16 p.m. signs of charring on ceiling boarding of passage over gas flame; also on 6th and 11th boards from bottom, the surface also turning white. |
| At 3.20 p.m. portions of ceiling in passage falling in flakes. | |
| | At 3.27 p.m. charred wood falling, ½ in. thick, from the ceiling boarding. |

| Ordinary Wood Partition, Outside (*continued*). | Non-Flammable Wood Partition, Outside (*continued*). |
|---|---|
| At 3.29 p.m. the boarding to ceiling in passage burned through and falling in lengths. | |
| At 3.30 p.m. the top board to partition on passage side burned through. | At 3.30. p.m. charred moulding falling off the 15th board from bottom. |
| At 3.32 p.m. the top part of door above top ledge mostly consumed, and flame drawing in over same. | At 3.32 p.m. large quantity of ceiling boarding falling and beams exposed to view. |
| | At 3.39 p.m. two lower boards of partition buckled near the gas flame, as if they were twisting away from studs. |
| | At 3.40 p.m. area of about 2 ft. by 2 ft. of the roof timbers of hut over gas flame incandescent. |
| At 3.42 p.m. the boarding to partition on passage side falling down. | |
| At 3.50 p.m. photograph of burning chamber taken. | At 3.50 p.m. charred pieces were falling; also pieces from the 14th and 13th boards, and the 14th was buckling. |
| | At 3.53 p.m. about 9 in. by 7 in. off 14th board, and the board was buckling badly next east wall. |

ORDINARY WOOD PARTITION, OUTSIDE (*continued*).

At 3.55 p.m. everything consumed, with the exception of the studs to partition, which were blazing freely, and the remains of some boarding to west of doorway.

At 3.58 p.m. water applied to extinguish remains and test concluded.

*Inside.*

At 3.13 p.m. smoke appeared in the interior of chamber.

At 3.25 p.m. sparks coming into chamber over top of door.

At 3.26 p.m. flame over top of door, which caught the hangings that were hung over and down the door on either side.

At 3.27 p.m. hangings over table caught alight and burned away.

At 3.28 p.m. tablecloth caught alight.

NON-FLAMMABLE WOOD PARTITION, OUTSIDE (*continued*).

At 3.55 p.m. flaming wood in 3rd board from bottom over third stud from east wall. Gas shut down, test concluded.

At 3.55 the inner chamber was entered.

*Inside.*

At 3.30 p.m. hut full of smoke with a very offensive smell.

ORDINARY WOOD PARTITION, INSIDE (*continued*).

At 3.35 p.m. smoke coming through into chamber along bottom of door, and also on the east side between partition and wall. A portion of the boarding to partition, on the inside just over table, became ignited from the burning tablecloth. This subsequently went out before the interior became well alight.

At 3.36 p.m. the top of the door on the inside blazing freely.

At 3.37 p.m. the boarding forming the ceiling against the top of the partition began to burn.

At 3.40 p.m. fire all along the top of the partition.

At 3.41 p.m. fire extending down door to the middle rail.

At 3.41½ p.m. chair-hanging suddenly caught alight and almost immediately the whole of the furniture began to burn.

At 3.42 p.m. the interior of the chamber well alight and everything blazing freely, the whole chamber being full of flame.

NON-FLAMMABLE WOOD PARTITION, INSIDE (*continued*).

At 3.37 p.m. smoke inside hut more intense, and large quantities issuing from draught holes.

ORDINARY WOOD PARTITION, INSIDE (*continued*).

NON-FLAMMABLE WOOD PARTITION, INSIDE (*continued*).

At 3.45 p.m. smoke very dense inside hut and large quantities still issuing from draught holes.

At 3.47 p.m. the door falling into the chamber.

At 3.49 p.m. inside of chamber clearer but objects therein hidden by smoke, except table close to the observation hole.

## OBSERVATIONS ON CONCLUSION OF THE TEST.

ORDINARY WOOD PARTITION.

NON-FLAMMABLE WOOD PARTITION.

*Outside.*

At 3.59 p.m. bright spot of flame in partition between the 12th and 13th boards, and flame on the 5th board, the flame being in the space between the boarding.

The flame noted at 3.55 p.m. now extended three boards high; immediately after this pieces of the 2nd, 3rd, 4th and 5th boards fell.

At 4.0 p m. spit of flame on 12th board disappeared.

NON-FLAMMABLE WOOD PARTITION.
OUTSIDE (*continued*).

At 4.5 p.m. a small jet of flame, which had expired, reappeared on 3rd board.

At 4.5 p.m. 3rd board from bottom blazing in front of 3rd stud from the east wall, and the flame about 14 in. high.

At 4.6 p.m. roof of hut burning on passage side.

At 4.16 p.m. debris still flaming and burning on outside of partition next pavement.

At 5.0 p.m, flames dying down. Heap of debris on the floor in state of incandescence.

At 5.4 p.m. water applied to roof of hut.

At 5.6 p.m. heap of embers and slight flame still burning on pavement outside, about 12 in. east of the gas outlet.

At 5.15 p.m. shreds and pieces of the boarding curling up (off the face of the boarding) outwards, and burnt ends of boards curling outwards.

NON-FLAMMABLE WOOD PARTITION
(*continued*).

*Inside.*

At 4.6 p.m. curtain and furniture inside the chamber intact.

At 4.8 p.m. furniture taken outside, the roof of hut being on fire.

At 4.22 p.m. bright spot of burning wood inside chamber and flame at floor about 2 ft. 6 in. from east wall.

At 4 40 p.m. flame now burnt through two places at floor level, one as last item and one nearer east wall (between 3 in. and 5 in. from wall).

At 4.45 p.m. lower part of partition still burning, in two places burnt through on to inside.

At 5.0 p.m. one flame went out on inside and one near the wall was dying out.

## OBSERVATIONS AFTER THE TEST.

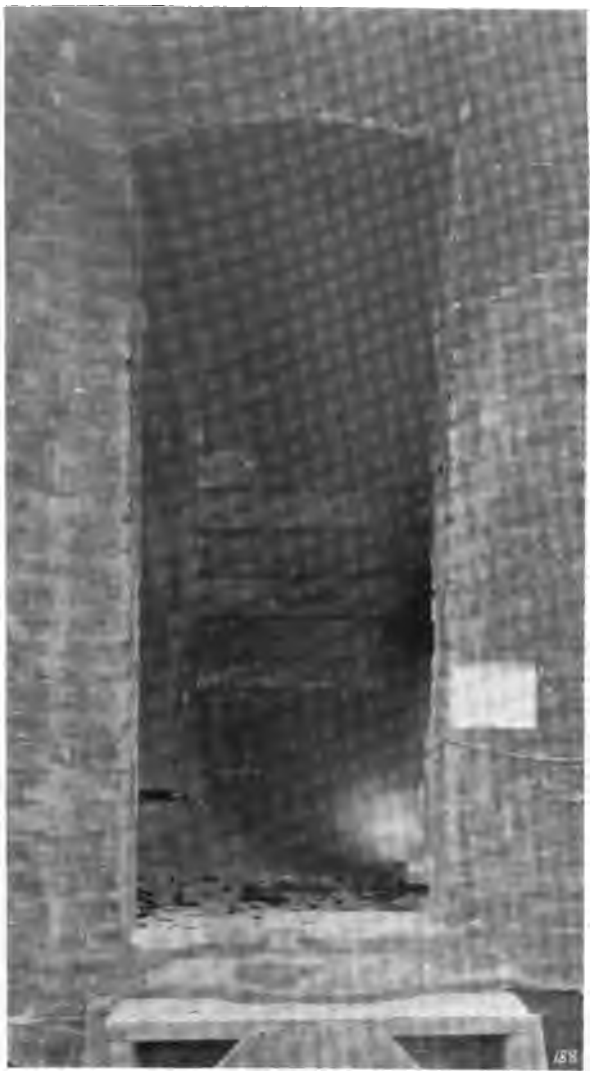
### NON-FLAMMABLE WOOD PARTITION.

A survey was made of the hut on the 5th May, when the following points were observed :—

OUTSIDE.—Door scorched at top, otherwise perfectly sound and japan on bolts and hinges unaffected, boarding on the left-hand side scorched at top and lower part of boarding, east side of door, 6 in. up face charred and flaked, but otherwise sound. The depth of the charred

ORDINARY WOOD PARTITION.

*Fig.* 13. VIEW DURING TEST (AFTER 40 MINUTES).



NON-FLAMMABLE WOOD PARTITION.

*Fig.* 12. VIEW DURING TEST (AFTER 40 MINUTES).

NON-FLAMMABLE WOOD PARTITION.

*Fig.* 14. VIEW ON CONCLUSION OF TEST (FROM INSIDE).

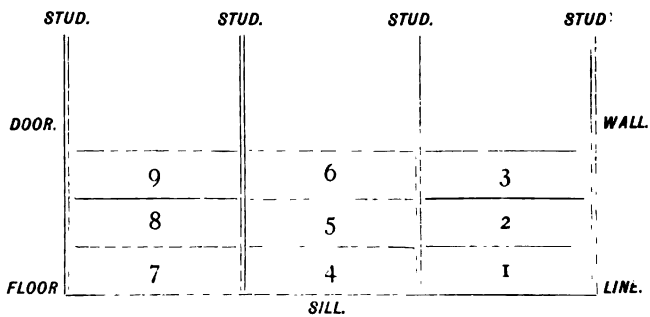
NON-FLAMMABLE WOOD PARTITION.
*Fig.* 15. VIEW ON CONCLUSION OF TEST (FROM OUTSIDE).

surface was as follows: 1st board $\frac{1}{8}$ in., 2nd $\frac{1}{4}$ in., 3rd $\frac{1}{4}$ in., 4th $\frac{1}{8}$ in. Paint on boards sound at the bottom to the east of doorway.

PARTITION directly against the gas aperture, 8 boards up, all gone between the studs, 9th about half gone, 10th quarter, 11th half, 12th charred but still in position, 13th ditto ditto, 14th and 15th about half gone. Between two east studs 4 boards gone; 5, 6, 7, 8, 9 and 10th boards in position, but charred; 11th partly gone, 12th in position but in two pieces; 13, 14 and 15 all gone.

STUDS.—East stud charred at bottom 2 ft. up; at top of same ditto, 1 ft. down; 2nd stud charred 2 ft. up; 11th board, one piece burnt nearly through around the nails, top of stud about 4 in. down charred. 3rd stud nearer flame, charred about 2 ft. 6 in. up, wood above perfectly sound, only discoloured. Top of this stud sound. Head between two east studs in position, but all charred; face of head in next bay slightly charred. Sill all charred between three studs.

Back of inside boarding as seen from passage.




Boards.

| | | |
|---|---|---|
| 1 | ... ... ... ... | Charred, all gone. |
| 2 | ... ... ... ... | " nearly gone. |
| 3 | ... ... ... ... | " $\frac{1}{8}$ in. |
| 4 | ... ... ... ... | " all through. |
| 5 | ... ... ... ... | " " |
| 6 | ... ... ... ... | " $\frac{1}{8}$ in. |
| 7 | ... ... ... ... | " $\frac{1}{2}$ in. and burnt through near the stud. |
| 8 | ... ... ... ... | " $\frac{1}{4}$ in. |
| 9 | ... ... ... ... | " $\frac{1}{4}$ in. |

About one-third of the boarding to ceiling in passage gone, the rest black and charred by the roof of hut burning away.

*Inside the Chamber.* Flooring intact and unaffected. Curtains and furniture intact and unaffected, except at the east end, where scorched through the burning of timber forming roof of hut. Boarded ceiling inside the chamber charred away next the east end, also by the burning of the roof of the hut.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising:—

Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead. (Directing Member.)
Mr. Max Clarke, A.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. Matt Garbutt, A.M.I.C E, A.R.I.B.A., Surveyor, Metropolitan Railway.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by:
Mr. H. Gundry, F.R.I.B.A., District Surveyor, Paddington.

The Executive was represented by:
Mr. Edwin O. Sachs (Chairman).
Mr. Charles E. Goad, M.Am.Soc.C.E., M.Can.Soc. C.E.

The Commercial Section was represented by:
Mr. Frederic R. Farrow, F.R.I.B.A.

The Members' Testing Sub-Committee was represented by:

Mr. George E. Monckton, M.A.

The general body of Members was represented by:

Mr. S. Flint Clarkson, F.R.I.B.A., District Surveyor, Chelsea.

Mr. C. H. Cooper, A.M.Inst.C.E., Surveyor to Urban District Council, Wimbledon.

Mr. Arthur Crow, F.R.I.B.A., District Surveyor, Whitechapel.

Mr. F W. Hamilton, A.R.I.B.A., District Surveyor, North Fulham.

Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark, and North Lambeth.

Mr. H. W. Tinne, J.P., Tunbridge Wells.

The London Non-Flammable Wood Company, Ltd., was represented by:

Admiral Sir Henry Nicholson, K.C.B.; Lieut-Col. James Colquhoun; Mr. S. E. Evershed; Mr. Arthur J. Greenop; Captain Laborde, R.N.; Captain G. McArthur, R.N.; Captain G. C. Sconce; Mr. Oscar Merrick.

The following visitors attended by special invitation of the Executive:—

Baron von Horst; General Stuart Nicholson, C.B., Commander George Hodgkinson, R.N. (British India Steam Navigation Company); Mr. G. K. Trench, Assistant Engineer, Trinity House; Mr. J. Goodchild, District Surveyor, East Islington; Mr. George H. Bibby, F.R.I.B.A. (Architects' Department, L.C.C.); Mr. R. Robertson (Architects' Department, L.C.C.); Mr. W. J. Heaton; Mr. G. H. Greaves; Mr. J. Armstrong; Mr. Howard Brunlees; Mr. Stephen Earl; Mr. Goodchild, Junr.; Mr. E. Greenop; Mr. J. Grimble Groves; Mr. A. Harley; Mr. James Johnstone; Mr. J. C. Kay; Surgeon-Major McSheehy; Mr. W. Nicholl; Mr. Norris; Mr.

T. F. Reeve ; Mr. Norman A. Reid ; Mr. James Ritchie ; Captain Russell ; Mr. W. Sanderson ; Mr. Schafer ; Mr. H. K. Sconce ; Mr. H. Turner ; Mr. Chas. Vertue.

*For the Sub-Committee conducting the test*:

F. HAMMOND (*Directing Member*).

*For the Executive and for the Commercial Section*:

FRED. R. FARROW.

Published by the Committee as directed by the Executive.

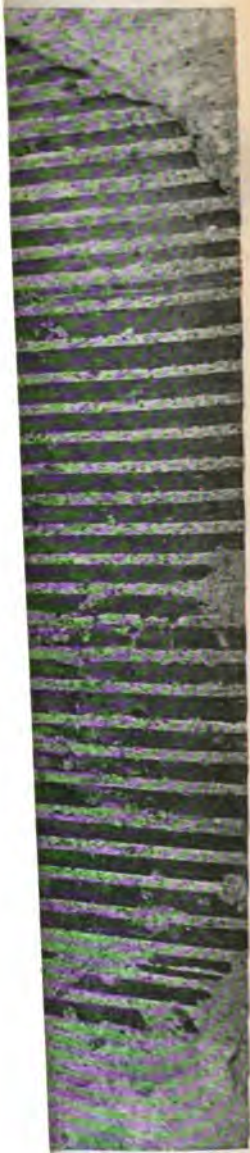
H. S. TAYLOR
*(Assistant Secretary)*.

*26th June*, 1900.

Verified a true copy of the Report, ordered to be published.

WILLIAMSON, HILL & Co.
*(Solicitors)*

*28th June*, 1900.



No. 58.

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 58.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH PARTITIONS

## A SUSPENDED PARTITION

BY

THE FIREPROOF PARTITION SYNDICATE, LTD.

LONDON

## The Committee's Report

*ALL RIGHTS RESERVED*

LONDON, 1901

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded* 1897—*Incorporated* 1899)
1 WATERLOO PLACE, PALL MALL

*Two Shillings and Sixpence*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superintending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington, Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington, Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass, a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. A Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke-Breeze Concrete.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.
SIR DOUGLAS FOX, Past President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
W. A. HART, Great Western Ry. Co.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers Past-President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past-President, Institute of Electrical Engineers.
ALEXANDER STENNING, F.R.I.B.A.
SIR JAMES WEEKES SZLUMPER, M.Inst.C.E., F.G.S., F.R.G.S.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President, The Surveyors' Institution.

*Executive:*
MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
T. E. GATEHOUSE, F.R.S.Ed.
MATT. GARBUTT, A.M.Inst.C.E., A.R.I.B.A.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A.
District Surveyor, Northern Division, City.

*Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL, AND CO.,
13 Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5 Coleman Street, E.C.

*Bankers:*
LLOYDS' BANK, LIMITED,
16 St. James's Street, S.W.

*Resident Engineer:*
T. KISSACK.

*Assist. Secretary:*
H. S. TAYLOR.

*Offices:*
2 WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

THE Report presented herewith deals with a second partition erected by the Fireproof Partition Syndicate, Ltd., the test having been undertaken in connection with an earlier test reported upon in publication No. 53, and it will be observed that the method of construction adopted by the makers is different from that originally applied, the partition, in fact, ranking as a "suspended" partition.

In comparing the reports it may be observed, that the time allowed for construction in this case is from June 26 to the date of test, July 25, being a summer month, whilst in the earlier test the time was March 9 to April 11, i.e. during the spring.

This point is mentioned as it was originally intended by the constructors to accord their partition a longer period for drying than was accorded for the earlier test.

EDWIN O. SACHS.

LONDON,
*October* 1, 1901.

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises an old mansion, standing in its own grounds, near Westbourne Park, and close to Royal Oak Station. The house is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

# OFFICIAL REPORT

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST No. 29. JULY 25th, 1901.

## A SUSPENDED PARTITION,

BY THE

FIREPROOF PARTITION SYNDICATE, LIMITED,

LONDON.

### OBJECT OF TEST.

To record the effect of a fire of one hour's duration, temperature gradually rising to 2000° Fahr. Water to be applied from inside for two minutes.

### SUMMARY OF EFFECT.

The framework and steel sheeting forming partition were found intact after the test, but two of the studs were bulged, and a small portion of the steel sheeting was burnt through and perished next the centre stud. The fire did not pass through the partition, but in one spot a red glow was seen through a crack. The temperature outside the partition next passage was not sufficient at any time during the test to affect the recording points of the pyrometer, but the hanging thermometer on face of partition in 55 minutes registered 200° Fahr. Most of the plaster inside the chamber fell during the test, and the remainder was disintegrated, bulged and ready to fall. A portion of the plaster outside the partition next passage fell, and several cracks appeared.

## DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as "No. 1 Hut."

The hut was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling was 8 ft. above the pavement of the hut.

The hut was covered with a tarpaulin.

The door-opening in the south wall measured 2 ft. 6 in. by 6 ft. 6 in.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The hut was divided as shown on plan, the partition being constructed from east to west, the full width and height of the hut, leaving a passage on the outside 2 ft. 1 in. wide. The size of the chamber was 7 ft. 10 in. by 10 ft.

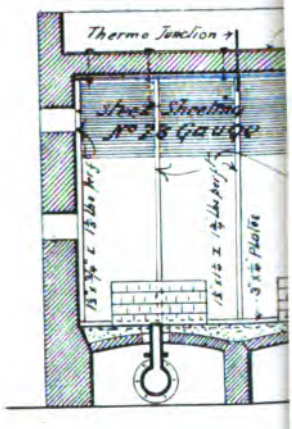
The gas was admitted through two mixing chambers of fire brick, each 7 ft. 3 in. by 3 ft. 6 in. as shown.

Two Roberts-Austin pyrometers were used for recording temperatures, one taking a continuous record from point No. 5, and one being used for the observation record at points Nos. 1, 2, 3, 4; points Nos. 1, 2, 5 were in the chamber and Nos. 3 and 4 outside in the passage.

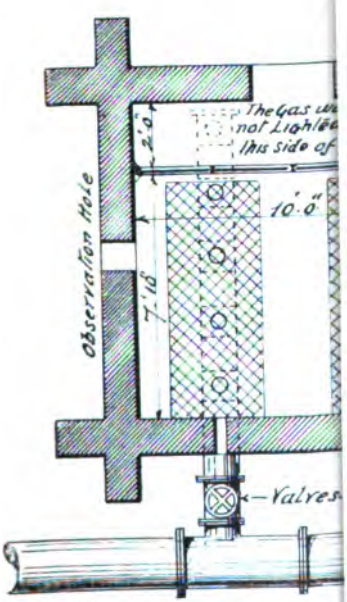
There were two observation holes, one in the east and one in the west wall, and two small observation holes in the north wall.

The stream of water was applied to the fire side of partition through the east observation hole by a branch with a ½-in. nozzle, supplied from a manual fire-engine.

*Note.*—The underside of wood beams forming the ceiling of the hut was covered with slag wool slabs 1½ in. thick. The height between the floor and ceiling was 7 ft. 10½ in.




SECTION LOOK




1041

PLAN OF

THE TES

*Fig.* 5.

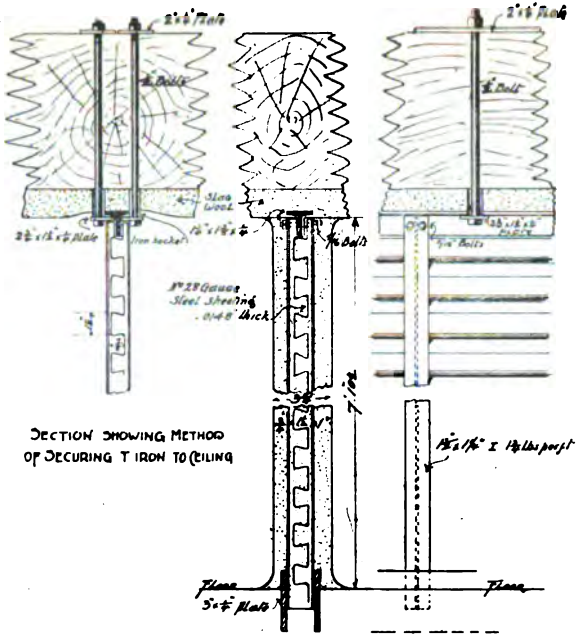



*Fig.* 6.

CONSTRUCTION OF PARTITION.

## CONSTRUCTION OF PARTITION.

On June 26 the iron framework of partition was erected. The ceiling piece was $1\frac{1}{4}$ in. by $1\frac{3}{8}$ in. by $\frac{1}{4}$-in. T-iron, $\frac{3}{4}$ lbs. per foot, and was secured to the ceiling with $\frac{1}{2}$-in. by 10-in. bolts with top and bottom plates; the top plates were 2 in. by $\frac{1}{4}$ in. by 10 ft. long, and the bottom plates were $1\frac{3}{16}$ in. by $1\frac{1}{2}$ in. by $3\frac{1}{2}$ in.

There was an iron channel against each wall $1\frac{1}{2}$ in. by $\frac{3}{4}$ in., $1\frac{1}{3}$ lbs. per foot, and three intermediate upright standards formed of T-irons $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in., $1\frac{3}{4}$ lbs. per foot. The standards were cut at the top to fit into the T-iron at ceiling and were bolted thereto with 2 in. by $1\frac{5}{16}$-in. bolts.

The iron standards were not secured at the bottom, but suspended from the top and placed between two iron plates 3 in. by $\frac{1}{4}$ in., which were let into the floor of the hut.

The partition was made with the "Cunnah-Wright" steel sheeting, No. 28 gauge, ·0148 in. thick, and had dovetail-shaped corrugations $1\frac{1}{8}$ in. by $\frac{7}{8}$ in. The sheeting fitted between the iron standards and was secured thereto with copper and galvanised iron wire.

On June 28 the first coat of plaster was put on. It was made with very fine coke breeze and coarse stuff (lime, sand and hair) in the proportion of 5 and 1, and was gauged with plaster of Paris in the proportion of 4 bushels of plaster to $\frac{3}{4}$ yard of incorporated stuff. An extra 7 lbs. of hair were added to the material with 7 lbs. of size.

All round the iron standards (inside the corrugations of each sheet) was covered with putty, plaster and hair.

There was a fillet round the walls, ceiling and floor.

On June 30 the second coat was put on. This consisted of 6 bushels of lime, sand and hair, to 2 bushels of plaster of Paris and $1\frac{1}{2}$ lb. of size.

The finishing coat was put on on July 4. This consisted of 3 parts of putty to 1 of sand, with 1 lb. of hair to each bushel of material, and $\frac{3}{8}$ of a lb. of size to each bushel.

The partition, when finished, measured $3\frac{1}{4}$ in. thick, the plaster on the inside being $\frac{1}{4}$ in. thicker than that on the outside.

On July 17 one coke fire was lighted in the hut and kept in for two days.

The partition when tested was dry.

## THE TEST.

On July 25, 1900, the test was undertaken.

The following is the log of the test:—

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:—

State of Weather, clouds; Rain, none; Wind, S.W.; Barometer, 29·90 in.; Attached Thermometer, 83° Fahr.; Dry Bulb, 90° Fahr.; Wet Bulb, 73° Fahr.; Remarks, Very hot afternoon.

### *Observations on Inside of Partition.*

4.25. Plastering pitted with small holes, and a little of the setting coat at top fallen.

4.32. Horizontal cracks in centre of partition and vertical cracks extending downwards from the same on the line of the centre standard.

4.33. Portions of the setting coat blown off in places.

4.38. The cracks above widening considerably.

4.47. Large piece of plaster, irregular in shape, but about 4 ft. by 3 ft. 1 in., fell. Partition bulging outwards.

4.53. Bulging was observed to be increasing.

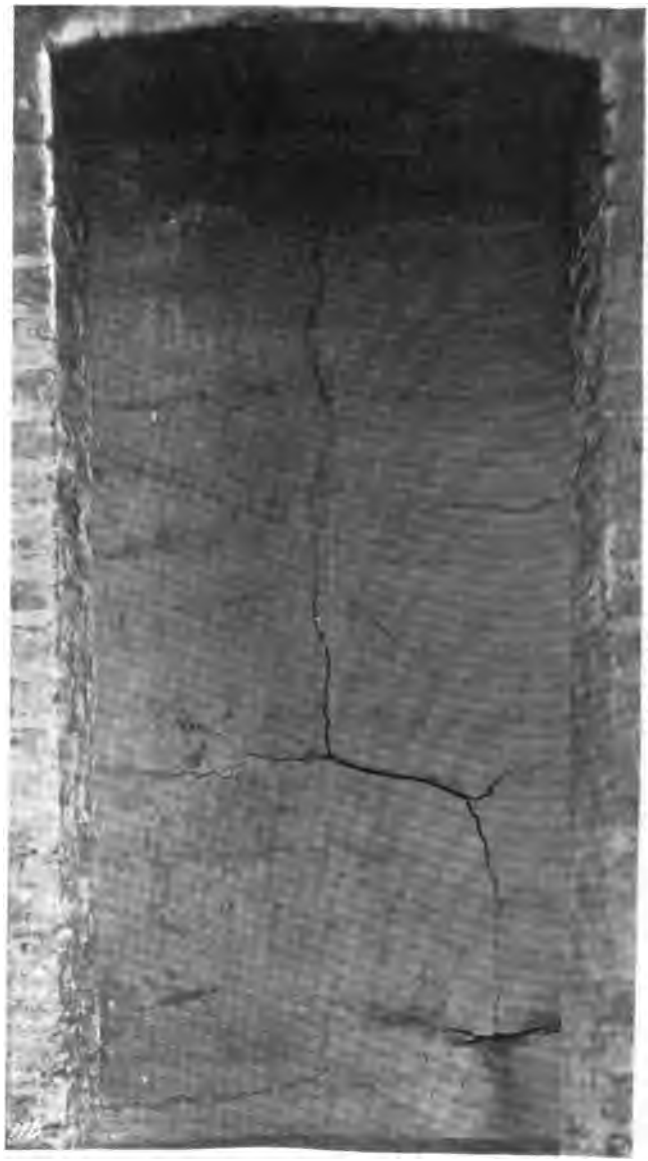


*Fig.* 7. VIEW SHOWING PARTITION DURING TEST.

*Fig.* 8. VIEW SHOWING PARTITION AFTER TEST.

5.6. Further plaster fallen in continuation on the west side.

5.15. Gas turned off.
5.16. Water turned on to the fire side.
5.18. Water turned off.

*Observations on Outside of Partition.*

4.15. Gas lighted.
4.25. Hair cracks vertically in centre in line of standards.
4.48. A blister developed 12 in. above floor and 3 ft. 6 in. from east side, and steam issuing therefrom; size of blister, 6 in. by 1½ in.
4.50. Above blister blew off.
4.50. Another blister developed and blew off 3 ft. 6 in. from ground and 4 ft. from east side; size of blister, 6 in. by 4 in.
4.55. Crack opening down centre and partition bulging to right of centre about half-way up.
4.57. Two other vertical cracks in line of studding on each side of centre one.
5.0. Various cracks on surface uniting the two blisters above-mentioned and running up to centre crack (*see* photo).
5.1. Cracks opening.
5.3. Heat coming through cracks and blisters.
5.10. Red glow seen through crack (*see* Fig. 7).

5.15. Gas turned off.
5.16. Water turned on inside.
5.16. About 1 yd. of plaster fell off to right of centre line (*see* photo).
5.18. About 1 yd. of plaster fell off to left of centre line (*see* photo).

## Temperature Recorded Outside Partition by Hanging Thermometer on Face.

| | |
|---|---|
| 4.31 p.m. ... ... ... ... | 100° |
| 4.42 „ ... ... ... ... | 110° |
| 4.54 „ ... ... ... ... | 148° |
| 5.0 „ ... ... ... ... | 160° |
| 5.6 „ ... ... ... ... | 170° |
| 5.10 „ ... ... ... ... | 200° |

## Observations taken from Points Nos. 2 and 3.

| Time. | No. 1. | No. 2. | No 3. | No. 4. |
|---|---|---|---|---|
| | | Fahr. | Fahr. | |
| 4.20 p.m. | | 880° | 860° | |
| 4.25 „ | | 1210° | 1210° | |
| 4.30 „ | | 1250° | 1240° | |
| 4.35 „ | | 1380° | 1380° | |
| 4.40 „ | | 1480° | 1500° | |
| 4.45 „ | | 1475° | 1425° | |
| 4.50 „ | | 1550° | 1500° | |
| 4.55 „ | | 1650° | 1550° | |
| 5.0 „ | | 1750° | 1650° | |
| 5.5 „ | | 1820° | 1750° | |
| 5.10 „ | | 1975° | 1800° | |
| 5.15 „ | | 1920° | 1600° | |

## OBSERVATIONS AFTER THE TEST.

On July 26 photographs were taken as shown in figures 9 and 10.

*Outside.*

On July 31 the following observations were made :—

A large portion of the plastering, about 5 ft. 6 in. long

and 3 ft. 1 in. wide, had fallen in the centre of the partition, exposing three centre standards or studs and the steel sheeting. The plastering was found to be $\frac{3}{4}$ in. thick above the fallen portion and 1 in. thick below. A vertical crack from the fallen portion extended all up the centre stud to the ceiling and down to the floor. A fine vertical crack extended above the fallen plastering on the west stud up to the ceiling and down to the floor. A crack about 2 ft. down from the ceiling extended the whole length of the partition, very fine at each end, about $\frac{1}{16}$ in. in the centre, and a few fine cracks were visible in places. The plastering above the fallen portion was bulged. The steel sheeting was bulged outwards on the right of the centre stud about $1\frac{1}{4}$ inch. A horizontal crack in the centre of the partition at the junction of the fillets next floor was observed on the outside about 5 feet long. Small holes showed through the plastering where the red glow was seen at A on photograph, 5.10.

*Inside.*

The greater portion of the plastering had fallen, and the remaining portions, which were 1 in. and $1\frac{1}{4}$ in. thick, were disintegrated, bulged, and ready to fall. The centre stud, 3 ft. up from the floor, was bulged outwards 1 in. The west stud, 3 ft. up from the floor, was bulged outwards $\frac{5}{8}$ in. A small portion of the steel sheeting was burnt through and perished near the centre stud.

## GENERAL ARRANGEMENTS.

The Test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead (Directing Member).
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. Max Clarke, A.R.I.B.A.

*Fig.* 9. VIEW OF PARTITION AFTER TEST.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by :—

Mr. Arthur Cates, F.R I.B.A., F.S.I., late Surveyor, Crown Estates.

Major-General Festing, C.B., South Kensington Museum.

The Executive was represented by :—

Mr. Edwin O. Sachs (Chairman).

Mr. T. E. Gatehouse, F.R.S.Ed.

The general body of Members was represented by :—

Mr. William Abbott, F.S.I.

Mr. T. Lewis Banks, F.R.I.B.A.

Mr. F. Sizer Capon, Architect's Department, L.C.C.

Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington.

Mr. Augustus Frere, F.R.I.B.A.

Mr. F. W. Hamilton, A.R.I.B.A., District Surveyor, North Fulham.

Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark.

Mr. W. Hewson Lees, A.R.I.B.A., District Surveyor, South-East Deptford.

Mr. N. B. McDermott, F.S.I., late of War Office.

Mr. R. P. Notley, F.R.I.B.A., District Surveyor, Bethnal Green.

Mr. L. Pyke, A.M.Inst.C.E.

Mr. H. H. Ray, Hand-in-Hand Fire and Life Office.

Mr. James Sheppard, North British and Mercantile Co.

Mr. Sydney R. J. Smith, F.R.I.B.A., F.S.I.

Mr. W. Waine.

Mr. F. Wallen, District Surveyor, West St. Pancras.

Mr. T. Wilkins, F.G.S.

Mr. Oswald C. Wylson, F.R.I.B.A.

The Fireproof Partition Syndicate, Ltd., was represented by :—

Mr. T. L. Cammell; Mr. J. A. Clay; and Mr. H. L. Cunnah.

The following visitors attended by special invitation of the Executive:—Mr. C. C. Absolom; Mr. L. Azario; Mr. Paul Blaschke; Mr. Clarence Coggin; Mr. Roy Collier; Mr. W. B. Downs; Mr. Albert Gray; Mr. J. Halford; Mr. J. Heyne; Mr. Septimus Marsland; Mr. E. Robins; Mr. R. Robertson; Mr. W. F. Sherman; Mr. A. W. Smith; and Mr. F. G. Winter.

Signed,

*For the Sub-Committee conducting the Test:*

F. HAMMOND (*Directing Member*).

*For the Commercial Section:*

FREDERIC R. FARROW.

*For the Executive:*

EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

*Date—July 1st*, 1901.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(*Solicitors*).

*Date—October 30th*, 1901.

LONDON: PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
STAMFORD STREET AND GREAT WINDMILL STREET.

FIG. 1. TIME 4.33. TEMP. 710°

FIG 2. TIME 4.36. TEMP 1110°

FIG. 3. TIME 4.39 TEMP 1375°

FIG. 4. TIME 4.49 TEMP. 1560°

FIG. 5. TIME 4.52. TEMP. 1575°

FIG 6. TIME 4.55. TEMP 1460°

VIEW OF DOORS DURING TEST. *Figs. 1 to 6.*

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 59.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH DOORS.

## A DEAL LEDGED DOOR WITH ONE-INCH BOARDING.

## A TWO-INCH DEAL FOUR-PANEL MOULDED BOTH SIDES DOOR.

## Particulars

OF

EXPERIMENTAL FIRE TESTS.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
*(Founded 1897—Incorporated 1899).*
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence nett.*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superindending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Home Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32-oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Maghogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete.

Printed by HAZELL, WATSON & VINEY, LD., London and Aylesbury.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*

EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.
SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.
PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.
SIR ALEXANDER BINNIE, M.Inst.C.E., Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.
THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.
ARTHUR CATES, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates; Member of Council and Past Vice-President, Royal Institute of British Architects.
H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor Eastern Division City of London; Past President, District Surveyors' Association.
SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.
PROFESSOR EWING, M.A., F.R.S., Cambridge University; Member of Council, Institution of Electrical Engineers.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington, Museum.
SIR DOUGLAS FOX, President, Institution Civil Engineers.
H. GUNDRY, F.R.I.B.A., President, District Surveyors' Association.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.
SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.
SIR NORMAN LOCKYER, C.B., F.R.S.
A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.
SIR W. HENRY PREECE, K.C.B., F.R.S., Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past President, Institution of Electrical Engineers.
JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.
W. E. RILEY, The Architect, London County Council.
ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.
THE RIGHT HON. THE EARL OF STRADBROKE.
ALEXANDER STENNING, F.R.I.B.A.
SIR ARTHUR SULLIVAN, Mus. Doc.
SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.
LIEUT.-COL. W. E. M. TOMLINSON, M.P.
W. P. TRELOAR, J.P., Alderman and Sheriff of the City of London.
HERBERT BEERBOHM TREE, Her Majesty's Theatre.
ROBERT VIGERS, Past President The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
MATT. GARBUTT, A.M.Inst C.E., A.R.I.B.A.
T. E. GATEHOUSE, F.R.S.Ed., A.M.Inst.C.E.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C E
F. HAMMOND, F.R.I.B A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.
C. H. WORDINGHAM, A.M.Inst.C.E., M.I.Mech.E., Past President, Municipal Electrical Association.

*Chairman of the Commercial Section:*

FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*

WILLIAMSON, HILL AND CO.,
13, Sherborne Lane, E.C.

*Accountants:*

JAMES AND EDWARDS,
5, Coleman Street, E.C.

*Bankers:*

LLOYDS' BANK, LIMITED,
16, St. James's Street, S.W.

*Resident Engineer:*

T. KISSACK.

*Hon. Secretary:*

GEORGE E. MONCKTON, M.A.

*Offices:*

1, WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE.*

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

The series of door tests undertaken by the Committee would not be complete if some record were not obtained regarding the resistance afforded by the more ordinary forms of doors in every-day use.

In an earlier publication (No. 24) some such records were already presented, but the doors under investigation were smaller than those that have lately been before the Committee, and the circumstances under which these tests were undertaken were very different.

So as to make the series of reports as complete as possible, and so as to afford every facility for true comparison, some further tests with a four-panel door and a ledged door, both of yellow deal, were arranged for during the past summer.

I trust that the results embodied in this publication will be found useful.

EDWIN O. SACHS.

LONDON,

*December* 15*th*, 1900.

## THE GENERAL ARRANGEMENTS FOR TESTS.

(*MEMORANDUM.*)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

# EXPERIMENTAL FIRE TESTS

*CONDUCTED BY THE EXECUTIVE*

OF THE

# British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

## FIRE TESTS Ia AND Ja, JULY 11TH, 1900.

## Ia.—A Deal Ledged Door with 1-in. Boarding.

## Ja.—A 2-in. Deal Four-panel moulded both sides Door.

### OBJECT OF TEST.

To record the effect of a fierce fire of one hour, gradually increasing to a temperature of 2,000° Fahr.

*Note.*—The fire was to be applied from one side, and the doors were to open inwards on to the fire side.

*Note.*—The door-openings were to be approximately 3 ft. 3 in. by 6 ft. 9 in.

### SUMMARY OF EFFECT.

#### DEAL LEDGED DOOR.

In 4 minutes flame appeared over top of door.
In 8 minutes flame had extended all along top.
In 21 minutes the upper half of door was fully alight.
In 25 minutes the test was closed, as the door was practically destroyed.

DEAL FOUR-PANEL MOULDED BOTH SIDES DOOR.

In 15 minutes flame appeared over top rail of door.

In 16 minutes flame came through top panel.

In 21 minutes flame came through lower panels.

In 25 minutes the test was closed, as the door was practically destroyed.

## DESCRIPTION OF TESTING PLANT.

*(See Figs.* A, B, C *and* D).

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 6 Hut.

The hut was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally. The ceiling of the hut was 9 ft. 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire-clay.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4, and one automatic record from point No. 5. Points Nos. 2 and 3 were outside the doors, and the others on the fire side of doors. *(See roof plan.)*

There were observation holes in the east and west walls, closed by movable iron shutters.

The draught holes were in the east and west walls.

The photographs were taken by daylight.

A brick wall, 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from east to west. It was built 13 in. back from the main

wall. The wall was carried up to the ceiling, the height between floor and ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

## CONSTRUCTION OF THE DOORS.

### Deal Ledged Door.

*(See Figs. E to G).*

The door was constructed, as shown in Figs. E and F, of wrought yellow deal. The vertical boards were tongued, groved and beaded, and were 6 in. wide and 1 in. thick.

The ledges were 6 in. by 1 in., chamfered on edges.

The ledges and boards were screwed together with $1\frac{1}{2}$ in. screws.

The frame was of yellow deal $4\frac{1}{2}$ in. by $3\frac{1}{2}$ in. with a rebate for door $\frac{5}{8}$ in. deep.

The sill was of oak, $4\frac{1}{2}$ in. by $3\frac{1}{2}$ in.

The door was hung with one pair of 20-in. cross garnetts, and fastened with a rim lock.

Neither the door or frame were painted.

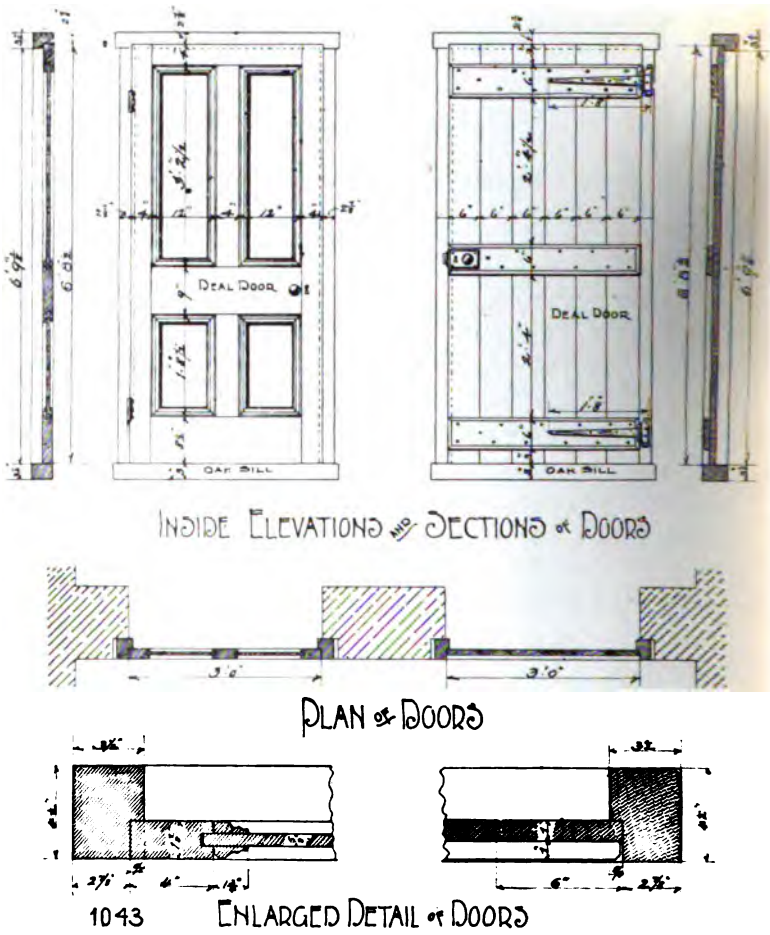
### The Deal Four-panel Door.

The door was constructed, as shown in Figs. E and F, of wrought yellow deal. The styles, rails and head were $1\frac{7}{8}$ in. thick, and the panels were $\frac{5}{8}$-in. thick. The moulding around panels was $1\frac{3}{4}$ in. wide, and was fixed in panels on both sides of door.

The frame was of yellow deal $4\frac{1}{2}$ in., by $3\frac{1}{2}$ in. with a rebate for door $\frac{5}{8}$ in. deep.

The sill was of oak $4\frac{1}{2}$ in. by 3 in.

The door was hung with one pair of 4 in. wrought iron butts, and fastened with a mortice lock and brass furniture.




*Figs.* E, F.

## PREPARATIONS FOR TEST.

On the afternoon of July 11th, photographs were taken of the two doors from the outside. (See Fig. G).

## THE TEST.

*(See Figs.* 1 *to* 12, *and* H *to* L*).*

On July 11th, the test was undertaken. The following is the log of the test :—

THE DOORS. *Fig.* G. VIEW BEFORE TEST (FROM OUTSIDE).

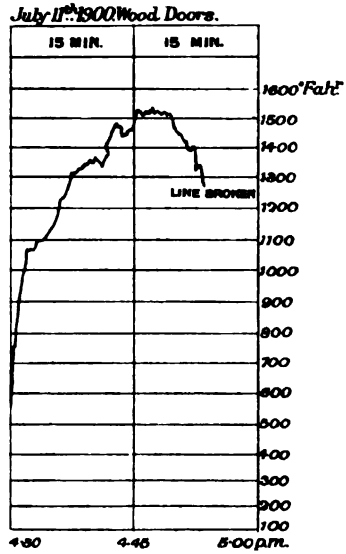
At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :— "State of weather, Clear and fine; Wind, N.W.; Barometer, 30·07; Attached Thermometer, 72·4° Fahr.; Dry bulb, 83° Fahr.; Wet bulb, 65·5° Fahr."

The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4.

OBSERVATIONS TAKEN AT POINTS, 1, 2, 3, 4.
*From* 4.33 *p.m. to* 4.54 *p.m.*

| | Inside. | | Outside. | |
|---|---|---|---|---|
| Time. | No. 1. Fahr. | No. 4. Fahr. | No. 2. Fahr. | No. 3. Fahr. |
| 4.30 p.m. | — | — | — | — |
| 4.33 „ | 710° | 850° | — | — |
| 4.36 „ | 1,110° | 1,150° | 100° | — |
| 4.39 „ | 1,375° | 1,400° | 460° | — |
| 4.42 „ | 1,440° | 1,440° | 740° | — |
| 4.45 „ | 1,530° | 1,530° | 1,010° | 105° |
| 4.48 „ | 1,560° | 1,550° | 1,350° | 1,140° |
| 4.51 „ | 1,575° | 1,575° | 1,500° | 1,210° |
| 4.54 „ | 1,460° | 1,500° | 1,200° | 1,100° |

Automatic Record at Point No. 5.



| DEAL LEDGED DOOR. | DEAL FOUR-PANEL DOOR. |
| --- | --- |
| At 4.30 p.m. the gas was turned on. | At 4.30 p.m. the gas was turned on. |
| *Observations on Inside.* | *Observations on Inside.* |
| At 4.34 p.m. door blazing freely all over the surface, the face charred. | At 4.34 p.m. door blazing freely all over the surface, the face charred. |
| | At 4.43 p.m. pieces of charred moulding falling from the panels. |
| At 4.46 p.m. pieces of charred wood falling. | |
| *Observations on Outside.* | *Observations on Outside.* |
| At 4.31 p.m. smoke issuing between rebate of frame and top of door and down each side for about three feet. | At 4.31 p.m. smoke appeared between rebate of frame and top rail of door and down each side for about three feet. |
| At 4.34 p.m. flame appeared between rebate of frame and top of door at west corner. | |
| At 4.38 p.m. flame extended all along top. | At 4.38 p.m. resin flowing down top rail. |
| At 4.44 p.m. flame extending down each side of door and through joints, also glow along bottom. | |
| | At 4.45 p.m. smoke came through between moulding and west style at top, with flame along top of door. |

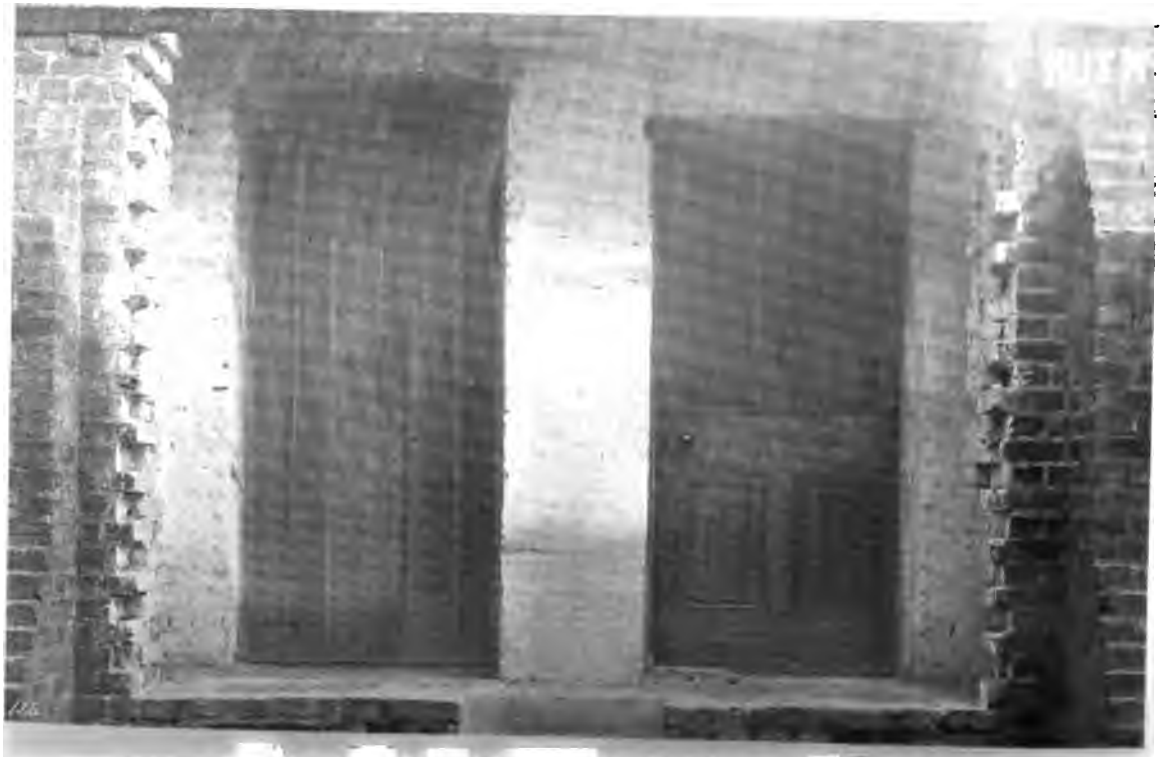


*Fig.* 11. VIEW SHOWING CONDITION OF DOORS AFTER 5 MINUTES.

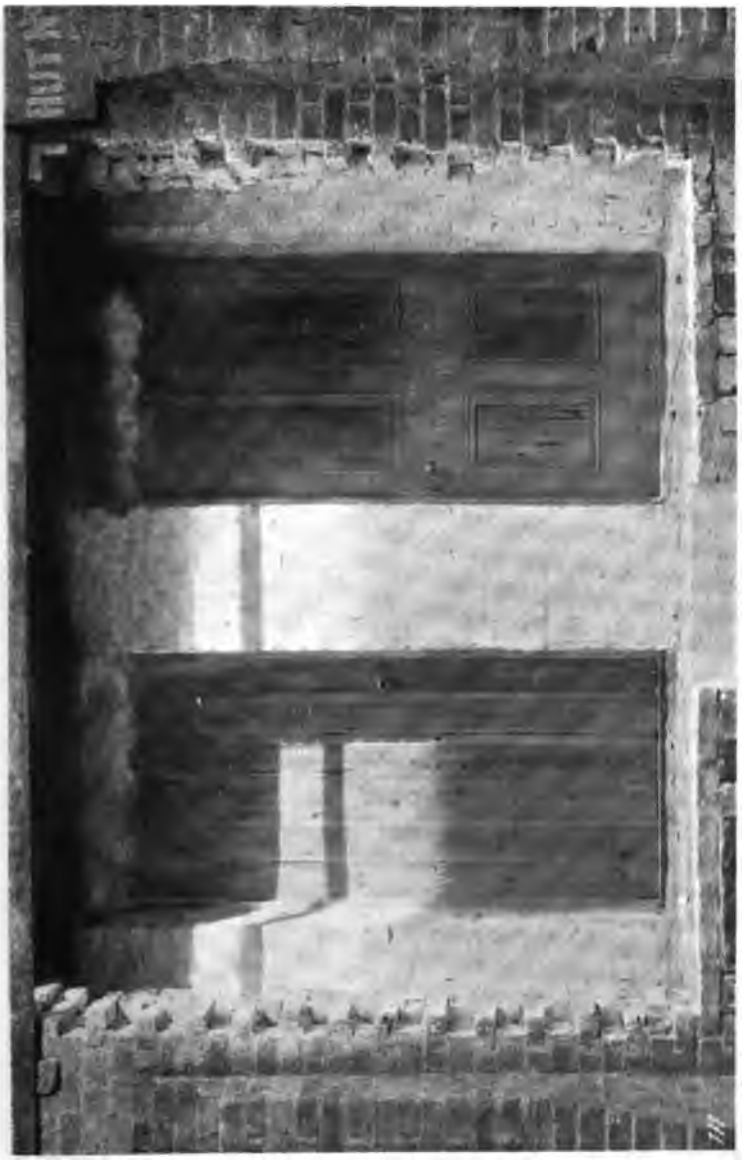


*Fig.* 1. VIEW SHOWING CONDITION OF DOORS AFTER 15 MINUTES.

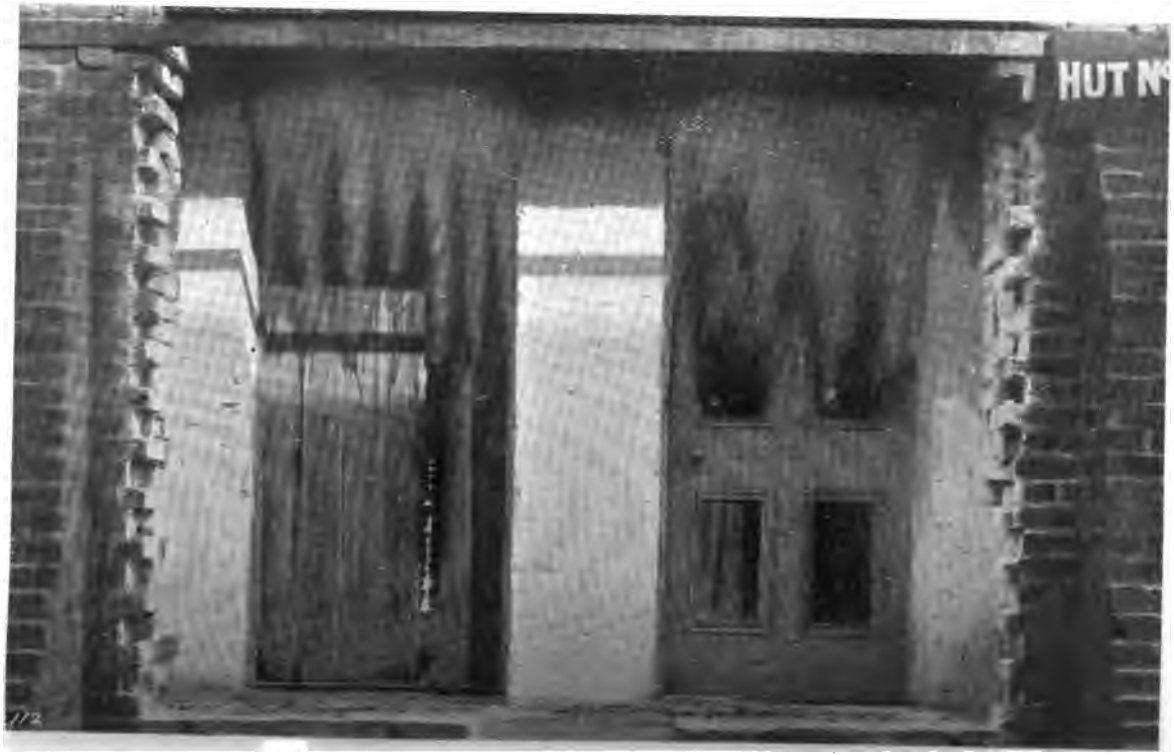



*Fig.* 8. VIEW SHOWING CONDITION OF DOORS AFTER 19 MINUTES.

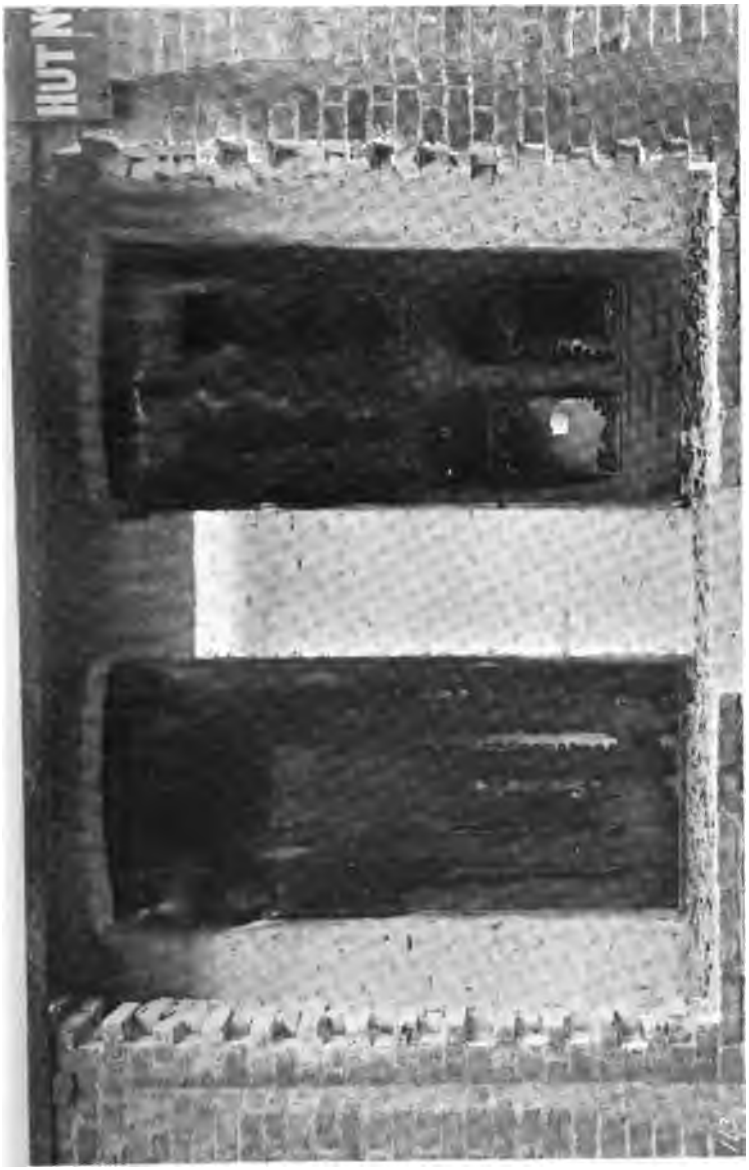


*Fig.* 1. VIEW SHOWING CONDITION OF DOORS AFTER 25 MINUTES.

DEAL LEDGED DOOR—*continued.*

At 4.47 p.m. glow seen through several joints.

At 4.51 p.m. the upper half of door fully alight, glow appearing through all joints in lower portion.

At 4.55 p.m. all joints open and blazing.

---

At 4.55 p.m. the gas was shut off.

At 4.57 p.m. water was applied and the test was closed.

DEAL FOUR-PANEL DOOR—*continued.*

At 4.46 p.m. flame appeared through top panels right and left.

At 4.48 p.m. holes burnt through top panels, lower panels charring.

At 4.50 p.m. the bottom left panel had flame through.

At 4.51 p.m. both lower panels in flame.

---

At 4.55 p.m. the gas was shut off.

At 4.57 p.m. water was applied and the test was closed.

## OBSERVATIONS AFTER TEST.

### DEAL LEDGED DOOR.

On July 12th the door and frame were still in position, but charred on the inside face ; also all vertical joints burnt through and the outer face of upper part much charred.

### DEAL FOUR-PANEL DOOR.

On July 12th the door and frame were still in position, but charred on the inside face, the panels being burnt out.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. Ellis Marsland, District Surveyor, Camberwell, (Directing Member).
Mr. Max Clarke, A.R.I.B.A.
Mr. F. R. Farrow, F.R.I.B.A.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the instrument room.

The Council was represented by :—

Mr. Arthur Cates, F.R.I.B.A., F.S.I., late Surveyor Crown Estates.

The Executive was represented by :—

Mr. Edwin O. Sachs (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E., M.Can.Soc.C.E.
Mr. T. E. Gatehouse, F.R.S.Ed., A.M.Inst.C.E., M.I.M.E., M.Inst.E.E.
Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.

The Members' Testing Sub-Committee was represented by :—

Mr. George E. Monckton, M.A.

The general body of members was represented by :—

Mr. F. Sizer Capon (Architect's Department, L.C.C.)

The following visitors attended by special invitation of the Executive :—

Mr. P. Blaschke, Mr. J. Burgess, Mr. H. A. Cheers, Mr. W. Fiddaman, Mr. E. J. A. Fulkes, Mr. Albert Gray, Lieut. P. S. Greig, R.E., Mr. G. F. Harrington, Mr. W. Hayne, Mr. J. Hurles, Mr. R. Morphew, Mr. C. Petri, Mr. E. Robins, Mr. P. Simpson, Mr. A. W. Smith and Sir George Thomas.

Signed,

*For the Sub-Committee conducting the Test*:

ELLIS MARSLAND.

*For the Commercial Section*:

FREDERIC R. FARROW.

*For the Executive*:

EDWIN O. SACHS.

Published by the Committee as directed by the Executive.

H. S. TAYLOR
*(Assistant Secretary).*

*Date—November 15th*, 1900.

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 60.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH DOORS

## AN IRON FRAMED DOOR, WITH STYLES AND RAILS BOTH SIDES

## AN IRON FRAMED DOOR, WITH STYLES AND RAILS ONE SIDE

## Particulars OF EXPERIMENTAL FIRE TESTS

*ALL RIGHTS RESERVED*

LONDON, 1901

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded, 1897—Incorporated, 1899*)
1 WATERLOO PLACE, PALL MALL

*Two Shillings and Sixpence*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superintending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington, Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington, Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. A Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke-Breeze Concrete.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

... ... ... 

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

THE report presented herewith deals with two iron doors constructed according to two different specifications, frequently described as the "Building Act" and the "Insurance" specifications respectively.

Further tests with iron doors will be undertaken in due course, so that a series of data may be available as in the case of the tests with wood doors.

EDWIN O. SACHS.

LONDON,
*March*, 1901.

SOTHERAN

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises an old mansion, standing in its own grounds, near Westbourne Park, and close to Royal Oak Station. The house is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*

# EXPERIMENTAL FIRE TESTS

*CONDUCTED BY THE EXECUTIVE*

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST MA.—MAY 10TH, 1901.

## A Floor of Steel Joists and Coke Breeze Concrete.

### OBJECT OF TEST.

To record the effect of a fire of two and a half hours' duration, commencing with a temperature of 500° Fahr., gradually increasing to a temperature not exceeding 2300° Fahr., followed at the end of the two and a half hours by the application of a stream of water for two minutes, and the consequent rapid cooling.

*Note.*—The area of the floor under investigation to be 77 feet superficial in the clear (10 ft. by 7 ft. 3 in).

The time allowed for construction and drying was six weeks (Spring).

### SUMMARY OF EFFECT.

After twelve minutes plastering began to fall from the soffit. Beyond this no other effect was observed during the test.

The fire did not pass through the floor.

On the application of water the soffit of the concrete, where struck by the water, was disintegrated for about ¾ in.

## DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The testing chamber was located at the Committee's Testing Station, and was known as "No. 4 Hut."

The chamber was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the floor tested was 9 ft. 6 in. above the pavement of the chamber.

The hut was covered in every night with tarpaulins.

The openings were bricked up on the morning of the test.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, each 7 ft. 8 in. by 3 ft., as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point No. 5, and the second to take four observation records from points 1, 2, 3, 4.

There were two observation holes, one in the north wall and one in the south wall.

The draught holes were in the north and south walls.

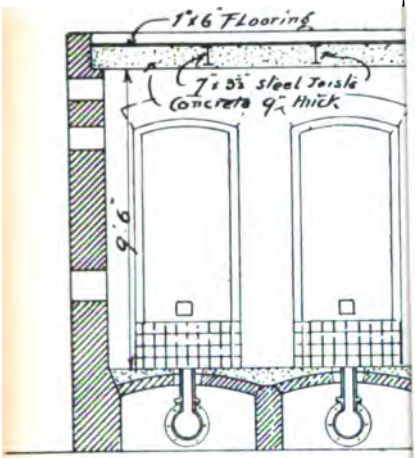
The photographs were taken by daylight.

The stream of water was applied through a branch with ½-inch nozzle, equipped with a pressure gauge, and supplied from a manual pump.

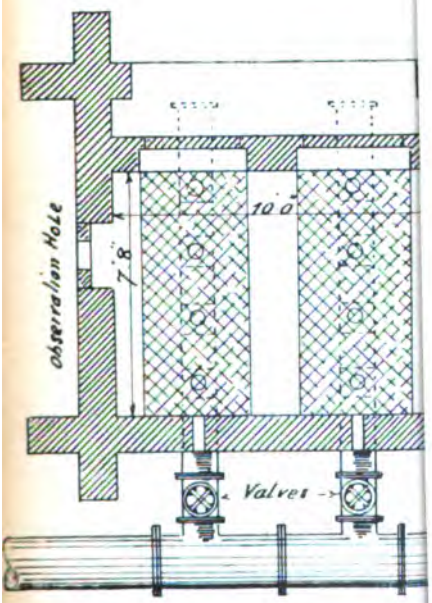
## CONSTRUCTION OF THE FLOOR.

(*See Figs.* 1 *to* 4.)

On March 26th wood centering for the support of concrete floor was erected. It was kept 2 in. below the steel joists.




SECTION LOOKING EA




PLAN OF HUT

TESTING CHAM

On March 27th two 7-in. by 3½-inch steel joists, weighing 16 lbs. per foot run, were put up, running from east to west, and spaced 3 ft. 4 in. centres.

The concrete floor was then put in.

This consisted of coke-breeze and Portland cement in the proportion of 5 and 1. It was made in batches of ½ yard, was turned over three times dry and three times wet, 12·6 gallons of water being used to each ½ yard of material.

The concrete was carried to the roof in buckets, emptied, and spread out between the joists, and carried 2 in. below, and was, therefore, 9 in. thick. It was put in in two layers, well stamped down with the feet and a shovel, and levelled off.

On April 9th the centering was struck.

On April 11th the ceiling was covered with a setting coat of lime putty and plaster of Paris in the usual proportions.

Flooring, 1 in. by 6 in., was nailed directly on the top of the concrete floor.

There was no load on the floor.

## THE TEST.

On May 10th the test was undertaken. The following is a log of the test:

At 2.45 p.m. the floor was intact.

At 3 p.m. the meteorological observations taken at the Botanical Gardens, Regent's Park, read as follows:

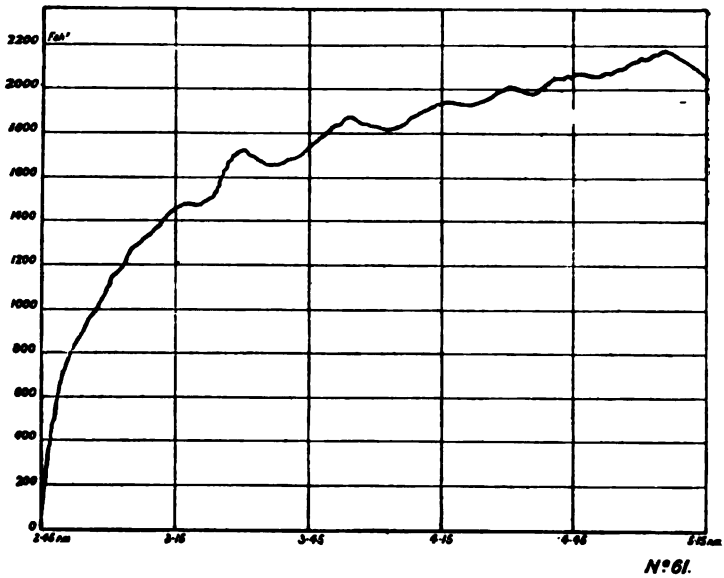
State of weather, overcast; Wind, N.N.E.; Barometer, 29.98 in.; Attached Thermometer, 53° Fahr.; Dry Bulb, 53° Fahr; Wet Bulb, 47·8° Fahr.; Dull afternoon, fair generally.

The table given on next page shows the temperatures taken from the four pyrometer observation points in the hut, as shown on the drawings Nos. 1, 2, 3, 4.

## Observations taken at Points Nos. 1, 2, 3, 4

*From* 2.50 *p.m. to* 5.15 *p.m.*

| Time | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| 2.50 p.m. | 700° Fahr. | 720° Fahr. | 730° Fahr. | 760° Fahr. |
| 2.55 „ | 880° „ | 940° „ | 920° „ | 1000° „ |
| 3.0 „ | 1030° „ | 1140° „ | 1130° „ | 1150° „ |
| 3.5 „ | 1120° „ | 1320° „ | 1300° „ | 1260° „ |
| 3.10 „ | 1230° „ | 1420° „ | 1430° „ | 1380° „ |
| 3.15 „ | 1340° „ | 1525° „ | 1500° „ | 1440° „ |
| 3.20 „ | 1360° „ | 1540° „ | 1520° „ | 1460° „ |
| 3.25 „ | 1410° „ | 1650° „ | 1680° „ | 1550° „ |
| 3.30 „ | 1560° „ | 1800° „ | 1830° „ | 1670° „ |
| 3.35 „ | 1560° „ | 1760° „ | 1780° „ | 1620° „ |
| 3.40 „ | 1570° „ | 1760° „ | 1780° „ | 1640° „ |
| 3.45 „ | 1605° „ | 1810° „ | 1840° „ | 1710° „ |
| 3.50 „ | 1700° „ | 1860° „ | 1880° „ | 1780° „ |
| 3.55 „ | 1780° „ | 1920° „ | 1960° „ | 1850° „ |
| 4.0 „ | 1760° „ | 1860° „ | 1900° „ | 1820° „ |
| 4.5 „ | 1760° „ | 1860° „ | 1900° „ | 1810° „ |
| 4.10 „ | 1820° „ | 1930° „ | 1960° „ | 1860° „ |
| 4.15 „ | 1850° „ | 1960° „ | 2000° „ | 1900° „ |
| 4.20 „ | 1840° „ | 1980° „ | 2000° „ | 1900° „ |
| 4.25 „ | 1880° „ | 2000° „ | 2040° „ | 1930° „ |
| 4.30 „ | 1920° „ | 2050° „ | 2070° „ | 1980° „ |
| 4.35 „ | 1920° „ | 2040° „ | 2040° „ | 1940° „ |
| 4.40 „ | 1980° „ | 2090° „ | 2100° „ | 2022° „ |
| 4.45 „ | 2020° „ | 2120° „ | 2120° „ | 2060° „ |
| 4.50 „ | 2000° „ | 2120° „ | 2120° „ | 2060° „ |
| 4.55 „ | 2020° „ | 2140° „ | 2140° „ | 2060° „ |
| 5.0 „ | 2080° „ | 2200° „ | 2200° „ | 2130° „ |
| 5.5 „ | 2100° „ | 2220° „ | 2230° „ | 2160° „ |
| 5.10 „ | 2060° „ | 2180° „ | 2180° „ | 2120° „ |
| 5.15 „ | 2000° „ | 2100° „ | 2100° „ | 2000° „ |




AUTOMATIC RECORD AT POINT NO. 5.

At 2.45 p.m. the gas was turned on.

At 2.47 p.m. about half a yard of the setting coat fell off the soffit in the centre, and from this time till 3.30 p.m. patches of plaster continued to fall at intervals. This was the only effect to record.

At 5.15 p.m. the test was concluded, and, on the gas being turned off, the underside of the floor was incandescent.

At 5.17 p.m. water was applied to the underside of floor for two minutes, at a pressure of about 15 to 20 lbs. The result was that further portions of the plaster, where struck by the water, fell down.

The fire had not passed through the floor.

On removing one of the floor-boards, the top flange of the joists was sufficiently cool to bear the hand.

The underside of floor-boards was only stained by the steam from the concrete.

## OBSERVATIONS AFTER TEST.

(*See Fig.* 5.)

On May 11th the photograph shown in Fig. 5 was taken.

On May 11th, at 2.55 p.m., the floor was examined, when most of the plastering had fallen, and what remained was loose and disintegrated.

The cracks, about $\frac{1}{10}$th of an inch wide, existed in line with the bottom flange of the steel joists.

The soffit of the concrete, where struck by the water, was disintegrated for about $\frac{3}{4}$ in.; otherwise the concrete was sound.

There was no deflection in the floor.

The floor-boards were sound and unaffected, as was also the top surface of the concrete.

## GENERAL ARRANGEMENTS.

The test was carried out in accordance with the procedure laid down by the Executive for investigations of this description, and conducted by a sub-committee comprising:—

Mr. Ellis Marsland, District Surveyor, Camberwell (*Directing Member*).
Mr. Max Clarke, A.R.I.B.A.
Mr. Chas. E. Goad, M. Am. Soc.C.E., M.Can.Soc.C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended the instrument room.

Mr. Edwin O. Sachs was in attendance on behalf of the Executive.

Signed,

*For the Sub-Committee conducting Test:*

ELLIS MARSLAND (*Directing Member*).

*For the Commercial Section:*

FREDERIC R. FARROW.

*For the Executive:*

EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

*Date—November* 1, 1901.

LONDON:
PRINTED BY WILLIAM CLOWES AND SONS, LIMITED
STAMFORD STREET AND GREAT WINDMILL STREET

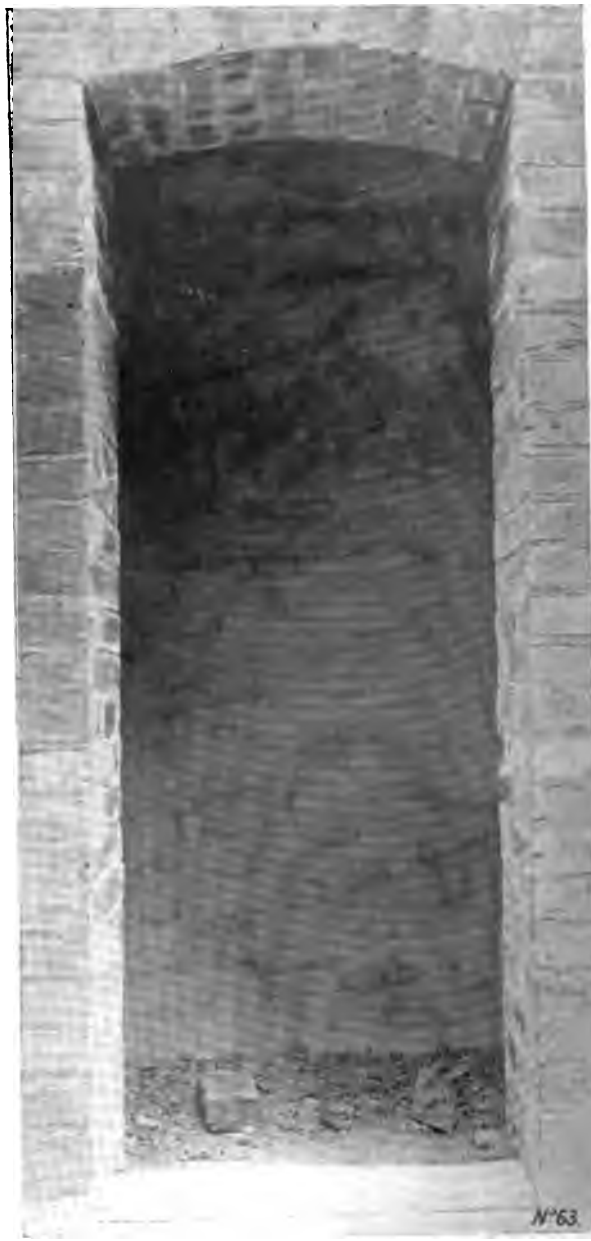



*Fig.* 8. VIEW TAKEN ON MAY 23RD, 1901.
WEST SIDE OF PARTITION AFTER TEST.

*ions of the*

*BRITISH FIRE PREVENTION COMMITTEE—No. 63.*

*by Edwin O. Sachs.*

# IRE TESTS WITH PARTITIONS

## A PARTITION

ERECTED BY

BANKS' FIREPROOF CONSTRUCTION SYNDICATE LTD.
LONDON

## THE COMMITTEE'S REPORT

*ALL RIGHTS RESERVED*

LONDON, 1901

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded* 1897—*Incorporated* 1899)
1 WATERLOO PLACE, PALL MALL

*Two Shillings and Sixpence*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superintending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Home Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington, Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington, Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels, a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. A Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke-Breeze Concrete.

# COUNCIL.

*President:*

.....

*Vice-Presidents:*

.....

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.

SIR WILLIAM H. BAILEY, J.P., Salford, Director, Manchester Ship Canal.

PROFESSOR ARCHIBALD 'BARR, D.Sc., Glasgow University.

SIR ALEXANDER BINNIE, M.Inst.C.E., late Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.

THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.

H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division City of London; Past President, District Surveyors' Association.

SIR W. MARTIN CONWAY, M.A., F.S.A.

ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.

MAJOR-GENERAL E. R FESTING, C.B., F.R.S., Science Department, South Kensington Museum.

SIR DOUGLAS FOX, Past President, Institution Civil Engineers.

W. A. HART, Great Western Ry. Co.

SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.

W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.

SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.

SIR NORMAN LOCKYER, C.B., F.R.S.

A. B. MACDONALD, M.Inst.C.E. City Engineer, Glasgow.

SIR W. HENRY PREECE, K.C.B., F.R.S., late Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past-President, Institution of Electrical Engineers.

JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.

W. E. RILEY, The Architect, London County Council.

ALEXANDER SIEMENS, M.Inst.C.E., Past-President, Institute of Electrical Engineers.

ALEXANDER STENNING, F.R.I.B.A.

SIR JAMES WEEKS SZLUMPER, M.Inst.C.E., F.G.S, F.R.G.S.

SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.

LIEUT.-COL. W. E. M. TOMLINSON, M.P.

SIR W. P. TRELOAR, J.P., Alderman of the City of London.

ROBERT VIGERS, Past President, The Surveyors' Institution.

*Executive:*

MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
T. E. GATEHOUSE, F.R.S.Ed.
MATT. GARBUTT, A.M.Inst.C.E., A.R.I.B.A.
CHARLES E. GOAD, M.Am.Soc.C.E, M.Can.Soc.C.E.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
EDMUND WOODTHORPE, M.A., F.R.I.B.A.
District Surveyor, Northern Division, City.

*Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL, AND CO.,
13 Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5 Coleman Street, E.C.

*Bankers:*
LONDON AND SOUTH-WESTERN BANK,
Regent Street, W.

*Resident Engineer:*
T. KISSACK.

*Assist. Secretary:*
H. S. TAYLOR.

*Offices:*
1 WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

THE Report presented herewith deals with a test which is of larger area than any conducted heretofore, the size of the floor being 22 ft. by 10 ft., and the report is therefore worthy of special consideration.

EDWIN O. SACHS.

LONDON,
*December* 10, 1901.

## THE GENERAL ARRANGEMENTS FOR TESTS.

*(MEMORANDUM.)*

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

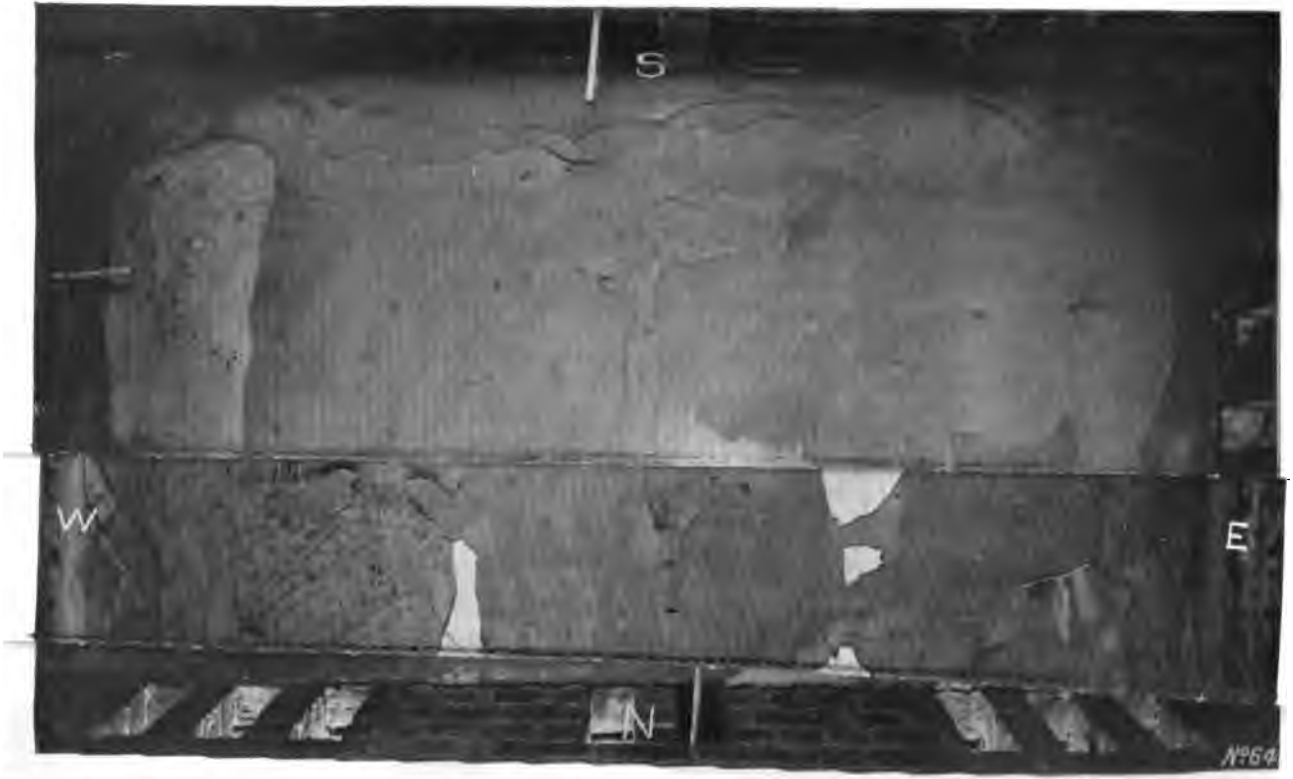
As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*




*Figs.* 9, 10, 11. THE FLOOR.—VIEWS FROM BELOW, AFTER TEST.

# OFFICIAL REPORT

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST No. 32. MAY 22, 1901.

## A FLOOR

BY THE

BANKS' FIREPROOF CONSTRUCTION SYNDICATE, LTD.

### OBJECT OF TEST.

To record the effect of a fire of three hours' duration, commencing with a temperature of 500° Fahr., gradually increasing to a temperature not exceeding 2500° Fahr., followed at the end of the three hours by the application of a stream of water for two minutes, and the consequent rapid cooling.

*Note.*—The area of the floor under investigation to be 222 ft. 6 in. superficial in the clear (10 ft. by 22 ft. 3 in.). The floor was to be loaded with 200 lbs. per ft. distributed.

The time allowed for construction and drying was about two months (Spring and Summer).

### SUMMARY OF EFFECT.

The floating and setting coat of the plaster on the under side of the suspended ceiling blew off in patches during the test.

On the application of water some more of the plaster fell off the soffit of the ceiling.

The concrete and steel joists forming the floor deflected during the test to a maximum of 2¼ in., but returned to within 1 in. of level on cooling and removal of the load.

The fire did not pass through the floor.

On the removal of the load the concrete was found to be cracked in the direction of the steel joists.

## DESCRIPTION OF TESTING PLANT.

(*See Figs. 1 to 4.*)

The testing chamber was located at the Committee's Testing Station, and was known as "No. 2 Hut."

The chamber was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 22 ft. 3 in. internally.

The ceiling of the floor tested was 7 ft. 11 in. above the pavement of the chamber.

The hut was roofed in every night either with galvanised iron or tarpaulins.

The door-openings on the north, south and west sides measured 2 ft. by 6 ft., and were closed by being filled in with half brickwork 4½ in. thick.

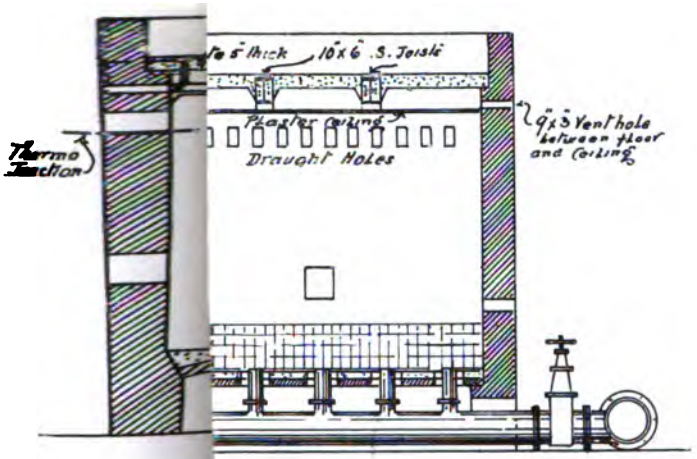
The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through four mixing chambers of firebrick, each 10 ft. by 3 ft., as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point 9, and the second to take eight observation records from points 1, 2, 3, 4, 5, 6, 7, 8.

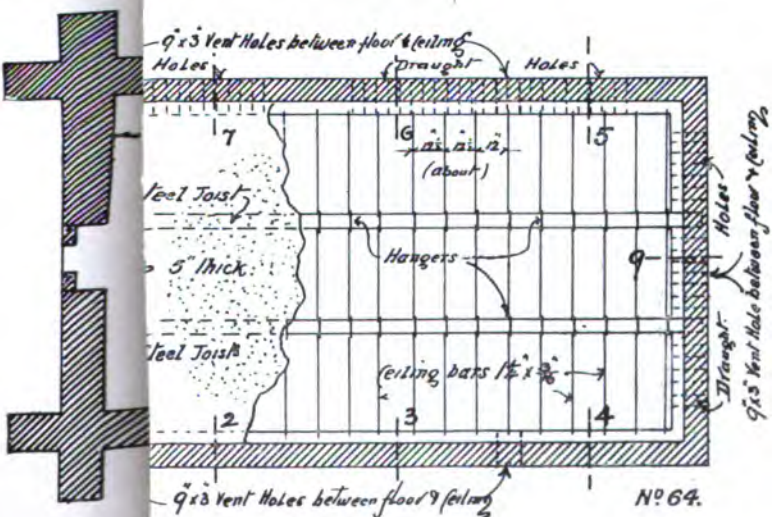
The load was of bricks, distributed evenly on the surface of the floor.

There were four observation holes in the east wall, one in the south wall, one in the north wall, and two in the west wall, the last four being formed in the bricked-up door-openings, and each covered with a movable iron shutter.




CTION LOOKING NORTH

1·2·3·4·5·6·7·8·9·10 are attached to Wires Leading and 10 are self recording




PLAN of FLOOR

The draught holes were in the east, north and south walls.

The photographs were taken partly by daylight and partly by flashlight.

The stream of water was applied through a branch with ½-in. nozzle, equipped with a pressure gauge, and supplied from a manual pump similarly equipped.

## CONSTRUCTION OF THE FLOOR.

(*See Figs.* 1 *to* 8.)

The construction of the floor, illustrated in Figs. 1 to 8, was as follows :

On March 13 two 10 in. by 6 in. steel joists, weighing 42 lbs. per ft., were placed in position on the walls running

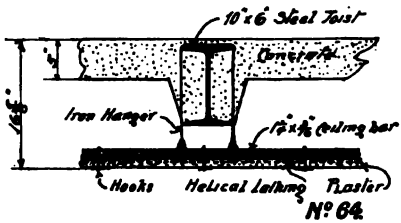



*Fig.* 5.

north and south, and resting 12 in. on the walls at each end. The ends of joists were not fixed into the walls, but left free with ends exposed. The joists were spaced 3 ft. 4 in. centre to centre.

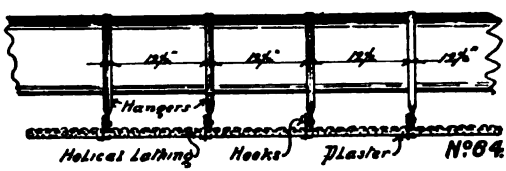
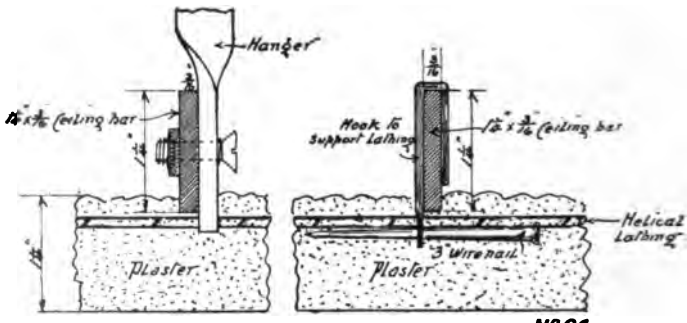



*Fig.* 6.

Over the joists, and spaced about 12½ in. apart, were put wrought-iron hanging straps 14¾ in. long, ¾ in. wide, and $\frac{3}{16}$ in. thick. Steel ceiling bars 1¼ in. wide and $\frac{3}{16}$ in. thick were bolted thereto with ¼ in. bolts.

*Note.*—These bars, to which was to be hung the suspended ceiling, were used for the support of the centering, some of which were unbolted at one end to allow of the centering being taken down. The ceiling bars were then replaced and securely bolted.

Over the ceiling bars special hooks were placed for the support of the metal lathing which was attached thereto




SECTION SHOWING CEILING BAR SECURED TO HANGER

SECTION SHOWING METHOD OF SECURING LATHING TO CEILING BAR

*Fig. 7.*

and pressed home to the under side of ceiling bars, and through the eye of the hooks a 3 in. wire nail was inserted to secure the lathing. The edges of lathing were overlapped one strand and bound together with No. 18 annealed wire. Steel helical lathing ¾ in. mesh, ·036 in. thick, was used.

On March 16 and 17 the concrete floor was put in. This consisted of pan breeze brought from the Old Kent

Road Gas Works, mixed with Portland cement in the proportion of 5 and 1. The breeze was fairly damp before being used. The concrete was turned over twice dry and twice wet, and while the water was being put on it was

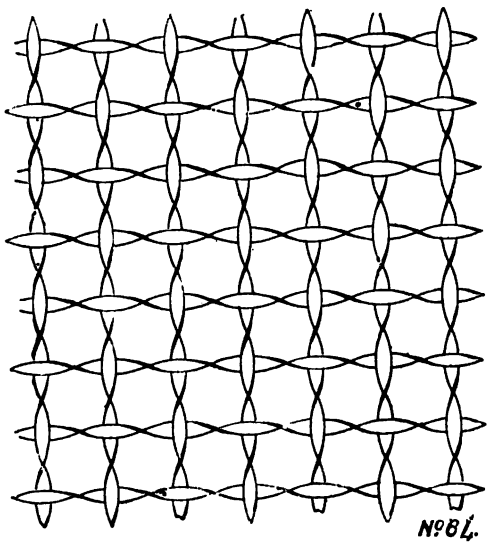



*Fig.* 8.

again turned over by degrees; 9·62 gallons of water were used to each ½ yard of material.

The concrete was taken to the floor in buckets and distributed over the surface, and stamped down with the feet and the flat side of a shovel.

The floor was 5 in. thick, and the concrete was carried down the sides of the steel joists to the bottom flange and 1 in. above the top flange, the joists except the lower flange being encased in the concrete.

On March 25 the centering was removed and the helical lathing before referred to was put up.

On March 29 the first coat of plaster was put on. This was mill-made coarse stuff brought to the Testing Station ready made, and was said to consist of lime, sand and hair

in the proportion of 2 parts of coarse stuff to 1 part of Portland cement, with 8 lbs. of hair to each yard of material.

On March 30 the second coat was put on; this was composed of the same material as the first coat.

On April 2 the last or finishing coat was put on. This was composed of Portland cement with trowelled face. The total thickness was $1\frac{1}{4}$ in.

Between the floor and suspended ceiling an air space was obtained by leaving out six 9 in. by 3 in. vent-holes in the walls open to the outer air.

During and after construction the floor was protected by being covered with tarpaulins till the morning of the test.

## PREPARATIONS FOR TEST.

On May 16 several cracks were observed in the plaster ceiling, running in all directions, particularly at the north end from east to west.

On May 16 the floor was loaded with 5450 stock-bricks, equal to a distributed load of 200 lbs. per sq. ft. over an area of 17 ft. by 8 ft. (136 sq. ft.).

The tarpaulin was finally removed on the morning of May 22, before the test began.

## THE TEST.

On May 22 the test was undertaken. The following is a log of the Test:

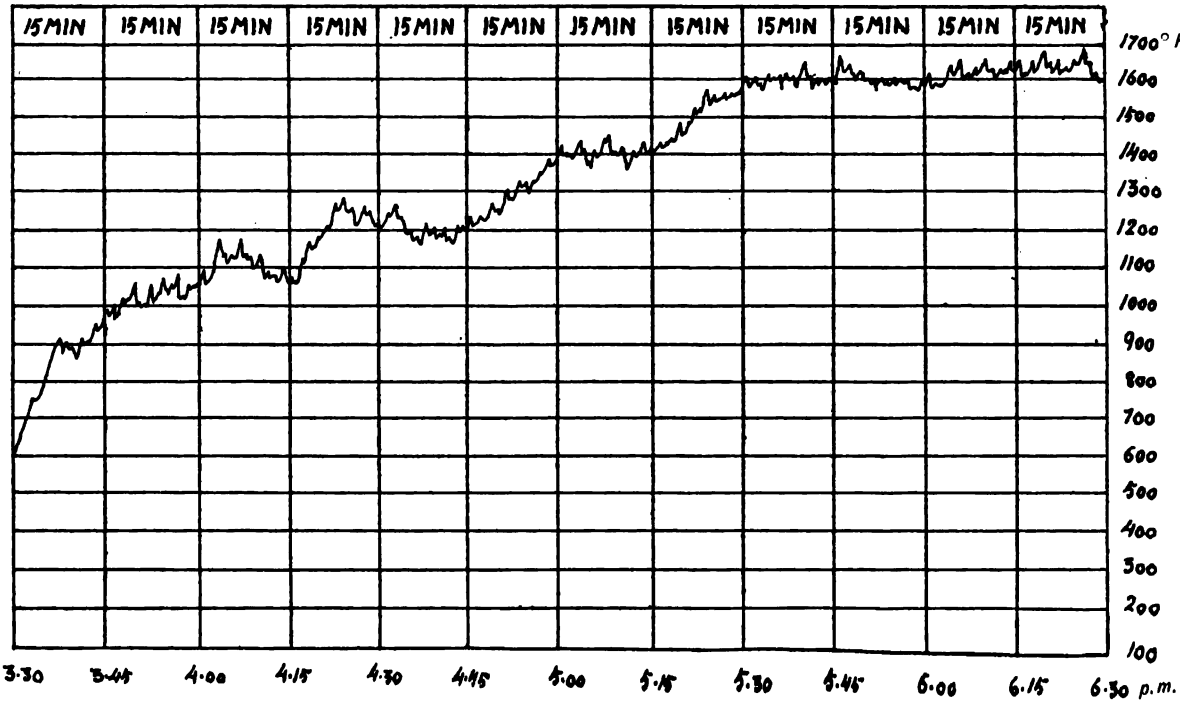
At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:

State of weather, clouds; Wind, E.S.E.; Barometer, 30·25 in.; Attached Thermometer, 63° Fahr.; Dry Bulb, 66·5° Fahr.; Wet Bulb, 53° Fahr.; Remarks, fresh varying breezes, fine afternoon.

OBSERVATIONS TAKEN AT POINTS NOS. 1, 2, 3, 4, 5, 6, 7, 8.

*From* 3.35 *p.m. to* 6.30 *p.m.*

| Time. | No. 1. | No. 2. | No. 3. | No. 4. | No. 5. | No. 6. | No. 7. | No. 8. |
|---|---|---|---|---|---|---|---|---|
| | Deg. F. | Deg. F. | Deg. F. | Deg. F. | Deg. F. | Deg. F. | Deg. F. | Deg. F. |
| 3.35 | 700 | 500 | 820 | 900 | 700 | 700 | 700 | 600 |
| 3.40 | 840 | 600 | 900 | 980 | 860 | 820 | 800 | 760 |
| 3.45 | 840 | 560 | 880 | 1000 | 900 | 900 | 820 | 800 |
| 3.50 | 900 | 510 | 950 | 1220 | 1130 | 940 | 900 | 870 |
| 3.55 | 1000 | 520 | 1000 | 1300 | 1140 | 980 | 940 | 940 |
| 4.0 | 920 | 540 | 1040 | 1300 | 1160 | 960 | 960 | 960 |
| 4.5 | 1000 | 600 | 1100 | 1360 | 1200 | 1120 | 1000 | 1000 |
| 4.10 | 1020 | 620 | 1020 | 1400 | 1180 | 1080 | 1020 | 1040 |
| 4.15 | 1000 | 600 | 1100 | 1320 | 1140 | 1040 | 1000 | 1000 |
| 4.20 | 1100 | 680 | 1120 | 1400 | 1300 | 1100 | 1100 | 1120 |
| 4.25 | 1200 | 700 | 1200 | 1500 | 1380 | 1200 | 1160 | 1160 |
| 4.30 | 1220 | 800 | 1240 | 1500 | 1340 | 1200 | 1200 | 1200 |
| 4.35 | 1220 | 800 | 1240 | 1480 | 1320 | 1200 | 1180 | 1180 |
| 4.40 | 1200 | 800 | 1240 | 1420 | 1280 | 1180 | 1180 | 1180 |
| 4.45 | 1200 | 840 | 1200 | 1500 | 1320 | 1200 | 1200 | 1200 |
| 4.50 | 1300 | 900 | 1300 | 1500 | 1380 | 1220 | 1220 | 1220 |
| 4.55 | 1340 | 920 | 1300 | 1580 | 1400 | 1260 | 1260 | 1260 |
| 5.0 | 1400 | 960 | 1340 | 1600 | 1440 | 1320 | 1320 | 1320 |
| 5.5 | 1420 | 1000 | 1400 | 1620 | 1500 | 1340 | 1340 | 1340 |
| 5.10 | 1420 | 1000 | 1400 | 1680 | 1460 | 1360 | 1360 | 1360 |
| 5.15 | 1420 | 1020 | 1400 | 1640 | 1500 | 1400 | 1400 | 1400 |
| 5.20 | 1500 | 1060 | 1420 | 1700 | 1500 | 1420 | 1420 | 1420 |
| 5.25 | 1560 | 1080 | 1500 | 1710 | 1520 | 1460 | 1460 | 1460 |
| 5.30 | 1600 | 1120 | 1530 | 1760 | 1660 | 1510 | 1510 | 1510 |
| 5.35 | 1620 | 1160 | 1560 | 1760 | 1700 | 1540 | 1540 | 1540 |
| 5.40 | 1640 | 1200 | 1560 | 1760 | 1720 | 1560 | 1560 | 1560 |
| 5.45 | 1640 | 1200 | 1560 | 1760 | 1700 | 1540 | 1540 | 1540 |
| 5.50 | 1640 | 1240 | 1560 | 1780 | 1700 | 1580 | 1580 | 1580 |
| 5.55 | 1640 | 1220 | 1580 | 1740 | 1640 | 1550 | 1550 | 1550 |
| 6.0 | 1640 | 1260 | 1580 | 1760 | 1660 | 1540 | 1540 | 1540 |
| 6.5 | 1640 | 1260 | 1580 | 1800 | 1680 | 1680 | 1680 | 1680 |
| 6.10 | 1650 | 1300 | 1580 | 1780 | 1670 | 1560 | 1560 | 1560 |
| 6.15 | 1660 | 1300 | 1600 | 1810 | 1720 | 1600 | 1600 | 1600 |
| 6.20 | 1700 | 1320 | 1600 | 1820 | 1730 | 1600 | 1600 | 1600 |
| 6.25 | 1680 | 1300 | 1600 | 1800 | 1700 | 1580 | 1580 | 1580 |
| 6.30 | 1640 | 1300 | 1520 | 1700 | 1400 | 1500 | 1500 | 1500 |




AUTOMATIC RECORD AT POINT 9.

The table on p. 13 shows the temperatures taken from the eight pyrometer observation points in the hut, as shown on the drawing as Nos. 1, 2, 3, 4, 5, 6, 7, 8.

At 3.30 p.m. the ceiling and floor were intact except for the hair cracks before mentioned in the ceiling.

At 3.30 p.m. the gas was lighted.

At 3.36 p.m. large portions of the setting coat of ceiling fell (more than half).

At 3.45 p.m. most of the setting coat had fallen.

At 3.48 p.m. part of the second coat (about 6 ft. by 5 ft.) fell at N.W. corner.

At 3.51 p.m. more of second coat on W. side fell.

At 3.52 p.m. about 3 ft. by 2 ft. of second coat at N.E. corner fell.

At 4.5 p.m. steam issuing from vent-holes between floor and ceiling.

At 4.8 p.m. more of second coat fell on W. side.

At 4.14 p.m. more of the second coat fell on W. side.

At 4.17 p.m. cracks appeared in ceiling.

At 4.35 p.m. two cracks extending along centre of ceiling from N. to S. parallel to E. and W. walls.

At 4.50 p.m. most of the second coat fallen along W. side ; cracks not increased much.

At 5.50 p.m. ceiling still up and intact.

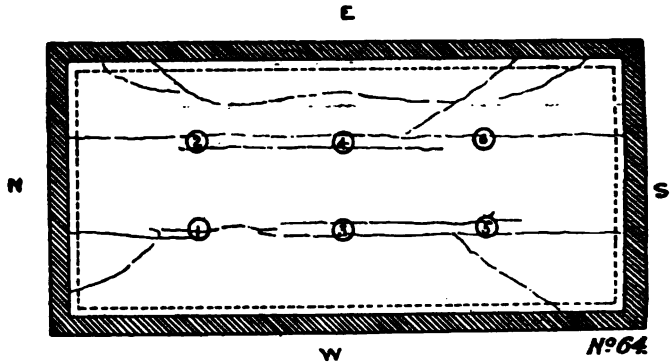
At 6.29 p.m. gas shut down.

At 6.30 p.m. water applied at pressure of about 20 lbs., which brought down some more of the second of plaster to ceiling as well as what remained of the setting coat.

The fire had not passed through the floor.

## DEFLECTION OBSERVATIONS.

The deflections of the steel joists were taken by a level placed on the roof of an adjoining hut, and wooden staffs were placed at the points 1, 2, 3, 4, 5, 6 indicated on Fig. 4, the readings being taken every 10 minutes during the test.




PLAN SHOWING CRACKS VISIBLE ON TOP SURFACE OF FLOOR.
The numbers on the plan indicate the points at which the deflections were taken.

TABLE SHOWING DEFLECTIONS OF STEEL JOISTS.

| Time. | Average Temperature. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| | Deg. F. | in. | in. | in. | in. | in. | in. |
| 3.30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.40 | 410 | 0 | 0 | 0 | 0 | $\frac{1}{8}$ | $\frac{1}{8}$ |
| 3.50 | 820 | $\frac{1}{4}$ | $\frac{1}{8}$ | $\frac{1}{4}$ | $\frac{3}{8}$ | $\frac{1}{4}$ | $\frac{1}{4}$ |
| 4.0 | 980 | $\frac{3}{8}$ | $\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{5}{8}$ | $\frac{3}{8}$ | $\frac{3}{8}$ |
| 4.10 | 1047 | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{5}{8}$ | $\frac{3}{4}$ | $\frac{1}{2}$ | $\frac{1}{2}$ |
| 4.20 | 1115 | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{7}{8}$ | $\frac{1}{2}$ | $\frac{5}{8}$ |
| 4.30 | 1225 | $\frac{5}{8}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{7}{8}$ | $\frac{5}{8}$ | $\frac{5}{8}$ |
| 4.40 | 1200 | $\frac{5}{8}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{7}{8}$ | $\frac{5}{8}$ | $\frac{3}{4}$ |
| 4.50 | 1255 | $\frac{5}{8}$ | $\frac{1}{2}$ | $\frac{7}{8}$ | 1 | $\frac{5}{8}$ | $\frac{3}{4}$ |
| 5.0 | 1337 | $\frac{5}{8}$ | $\frac{5}{8}$ | 1 | $1\frac{1}{8}$ | $\frac{7}{8}$ | 1 |
| 5.10 | 1380 | $\frac{7}{8}$ | $\frac{3}{4}$ | $1\frac{1}{8}$ | $1\frac{3}{8}$ | $\frac{7}{8}$ | 1 |
| 5.20 | 1430 | $\frac{7}{8}$ | $\frac{3}{4}$ | $1\frac{1}{4}$ | $1\frac{3}{8}$ | $\frac{7}{8}$ | 1 |
| 5.30 | 1525 | $\frac{7}{8}$ | $\frac{3}{4}$ | $1\frac{1}{4}$ | $1\frac{3}{8}$ | $\frac{7}{8}$ | $1\frac{1}{8}$ |
| 5.40 | 1570 | $\frac{7}{8}$ | $\frac{7}{8}$ | $1\frac{1}{4}$ | $1\frac{1}{2}$ | 1 | $1\frac{1}{4}$ |
| 5.50 | 1582 | 1 | 1 | $1\frac{1}{2}$ | $1\frac{3}{4}$ | $1\frac{1}{8}$ | $1\frac{3}{8}$ |
| 6.0 | 1565 | 1 | 1 | $1\frac{5}{8}$ | $1\frac{7}{8}$ | $1\frac{1}{4}$ | $1\frac{1}{2}$ |
| 6.10 | 1610 | $1\frac{1}{8}$ | $1\frac{1}{4}$ | $1\frac{3}{4}$ | $1\frac{7}{8}$ | $1\frac{3}{8}$ | $1\frac{5}{8}$ |
| 6.20 | 1621 | $1\frac{3}{8}$ | $1\frac{1}{2}$ | 2 | $2\frac{1}{8}$ | $1\frac{3}{4}$ | 2 |
| 6.30 | 1602 | $1\frac{1}{2}$ | $1\frac{1}{2}$ | $2\frac{1}{4}$ | $2\frac{1}{8}$ | $1\frac{7}{8}$ | 2 |

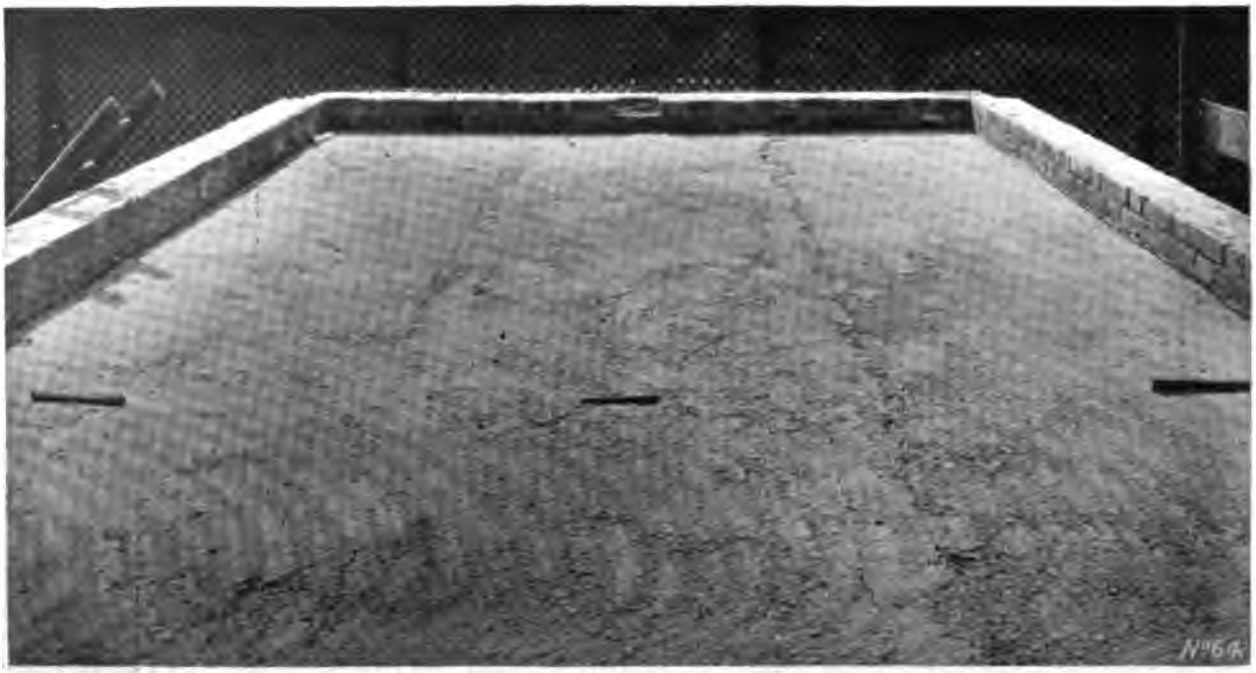


*Fig.* 12. THE FLOOR.—VIEW AFTER TEST, FROM ABOVE.

## OBSERVATIONS AFTER TEST.

(*See Figs.* 9 *to* 13.)

On May 22 at 6.37 p.m. the top of the concrete was inspected and the side walls were leaning outwards, away from the edge of the concrete $1\frac{1}{4}$ in. in the centre, down to nothing at each end. The end walls were leaning outwards, away from the edge of the concrete 1 in. in the centre, down to nothing at the sides.

On May 24 and 25 the photographs shown in Figs. 9 to 13 were taken.

On May 24 the load was removed.

On May 24 the surface of the top of the floor showed the cracks indicated in plan on page 16. They varied from $\frac{1}{8}$ in. to $\frac{1}{20}$ in. wide.

The soffit of the suspended ceiling was as follows :

The first coat of plaster was intact and very little deteriorated.

Of the second coat about two-thirds remained.

Of the setting coat very little was left, and this in small patches at various parts.

The lathing had not sagged, but only followed the deflection of the joists.

The permanent deflection of the floor after the removal of the load was about 1 in.

The fire had not passed through the floor.

The concrete of the floor was sound and unaffected by the fire, except for the cracks above mentioned.

On November 27 the side walls were plumbed in the centre and found to be leaning over $\frac{5}{8}$ in. at the top. The edge of the concrete was $\frac{7}{8}$ in. clear of the wall at the east side and $\frac{1}{2}$ in. on the west side, when the above observations were made on November 27.

No further observations were made.

## GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising—

Mr. Ellis Marsland, District Surveyor, Camberwell (Directing Member).
Mr. Ed. Woodthorpe, M.A., F.R.I.B.A.
Mr. T. E. Gatehouse, F.R.S.Ed.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by—

Mr. H. H. Collins, Past President, District Surveyors' Association.
Major-General E. R. Festing, C.B. (South Kensington Museum).
Mr. W. A. Hart (G.W.R. Co.).

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E.
Mr. F. Hammond, F.R.I.B.A.

The Members' Testing Sub-Committee was represented by—

Mr. G. E. Monckton, M.A.

The general body of Members was represented by—

Mr. W. H. A. Berry, A.R.I.B.A.—Mr. T. F. Britton (L. G. Omnibus Co.)—Mr. F. Sizer Capon (Architect's Department, L.C.C.)—Mr. J. H. Colls—Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington—Mr. Bryan Donkin, M.Inst.C.E., M.Inst.M.E.—Mr. E. Dru Drury, F.R.I.B.A., F.S.I. (District Surveyor, Westminster)—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. A. J.

L. Evans, Borough Engineer and Surveyor, Luton—M . W. M. Fawcett, F.R.I.B.A.—Mr. Horace S. Folker (Hon. Gen. Sec. National Fire Brigades' Union)—Mr. W. Grellier, F.R.I.B.A., District Surveyor, Clapham—Mr. Killingworth Hedges, M. Inst. C.E., M.I.E.E.—Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark—Mr. Thomas Leach, Chief Officer, Fire Brigade, Wimbledon —Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington—Mr. J. R. Manning, M.S.A.—Mr. J. W. Metcalf, A.M. Inst. C.E.—Mr. R. P. Notley, F.R.I.B.A., F.S.I., District Surveyor, Bethnal Green—Mr. C. E. Parker-Rhodes—Mr. A. Saxon Snell, F.R.I.B.A.—Mr. H. H. Statham, F.R.I.B.A.—Mr. H. W. Tinné, J.P.—Mr. Thos. Wilkins, F.G.S.—Major Winn, R.E.

The Commercial Section was represented by—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman)—Mr. H. Coward (Messrs. Davenport & Coward)—Mr J. H. Crittall (The Crittall Manufacturing Co.)—Mr. G. Davenport (Messrs. Davenport & Coward)—Mr. J. F. Golding (The New Expanded Metal Co.)—Mr. Brees van Homan (Messrs. Homan and Rodgers)—Mr. J. D. O'Briern (The Columbian Fireproofing Co.)—Mr. T. Potter (Potter & Co.)—Mr. A. Reid (Messrs. Anderson & Son)—Mr. E. R. Runnacles (The Crittall Manufacturing Co.)—Mr. J. H. Sankey (Messrs. Sankey & Son)—Mr. W. H. Strode (Messrs. Strode & Co.)—Mr. Hubert Todd (Messrs. W. B. Wilkinson & Co.)—Mr. F. Wallers (Messrs. Dowson, Taylor & Co.)—Mr. A. Williams (Messrs. G. A. Williams & Sons).

Messrs. Banks' Fireproof Construction Syndicate, Ltd., was represented by—

Mr. T. Lewis Banks, F.R.I.B.A.—Mr. L. C. Banks—Mr. T. Drew-Bear—Mr. A. Pye-Smith—Mr. T. Simpson.

The following visitors attended by special invitation of the Executive—

Mr. H. A. Ball; Mr. W. Banister (Messrs. Barry, Head & Co.); Mr. J. B. Becker; Mr. J. H. Beckett (Railway

Clearing House); Mr. W. J. W. Beckey; Mr. R. J. Collier; Mr. J. Cowper (Columbian Fireproofing Co.); Mr. H. F. Donaldson (Royal Arsenal, Woolwich); Mr. H. Dru Drury; Mr. Drew-Bear; Mr. E. Duckham, C.E.; Mr. E. Enoch; Mr. Chas. Gude; Mr. C. S. Halse; Mr. J. Hart; Mr. A. Louis Guye; Mr. H. C. Higgins; Mr. A. James (Messrs. James & Edwards); Mr. Arthur Morris; Mr. John C. T. Murray (Admiralty); Admiral Sir Henry Nicholson, K.C.B.; Mr. Richard Perkins; Mr. R. Randall Phillips; Mr. H. Plummer; Mr. F. W. Schafer; Mr. H. B. Squire; Mr. G. J. Stubbings (G.E.R. Co.); Mr. Philip Spier; Mr. W. A. Thomas; Mr. Frank Turton; Mr. F. W. Wann; Mr. Winks; Mr. Wm. Young, F.R.I.B.A.; Mr. Chas. Young; and Mr. A. E. Brown.

Signed,

*For the Sub-Committee conducting Test:*
ELLIS MARSLAND.

*For the Commercial Section:*
FREDERIC R. FARROW.

*For the Executive:*
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assistant Secretary*).

*Date—November* 27, 1901.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(*Solicitors*).

*Date—December* 13, 1901.

LONDON: PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
GREAT WINDMILL STREET, W., AND DUKE STREET, STAMFORD STREET, S.E.

GENERAL VIEW OF NEW TESTING STATION, NEAR WESTBOURNE PARK.

*Publications of the*
*BRITISH FIRE PREVENTION COMMITTEE—No.* 65
*Edited by Edwin O. Sachs*

# THE TESTING ARRANGEMENTS OF THE BRITISH FIRE PREVENTION COMMITTEE

SOME DESCRIPTIVE NOTES WITH ILLUSTRATIONS

BY

ELLIS MARSLAND

DISTRICT SURVEYOR, CAMBERWELL; HON. SEC. SOCIETY OF ARCHITECTS;
HON. SECRETARY OF THE BRITISH FIRE PREVENTION COMMITTEE;
CHAIRMAN OF THE TESTING STATION SUB-COMMITTEE

LONDON, 1902

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded* 1897—*Incorporated* 1899)
1 WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence*

# PUBLICATIONS

OF THE

# BRITISH FIRE PREVENTION COMMITTEE.

1. WHAT IS FIRE PROTECTION. A Study. By EDWIN O. SACHS.
2. AMERICAN OPINIONS ON FIRE PREVENTION. Abstracts from Papers. By EDWARD ATKINSON and others.
3. THE PARIS BAZAAR FIRE. A Paper, with Illustrations. By EDWIN O. SACHS.
4. THEATRE EXITS. A Paper. By ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A.
5. NEW YORK FIRE DEPARTMENT. A Paper, with Illustrations. By HUGH BONNER, Chief Officer, New York.
6. COTTON FIRES AND COTTON BALES. A Paper, with Illustrations. By R. H. SCOTTER, C.E.
7. FIRE-RESISTING FLOORS USED IN LONDON. A Paper, with Illustration. By FREDERICK FARROW, F.R.I.B.A.
8. FIRE SERVICE IN FACTORIES, WORKS, ETC. A Paper, with Illustrations. By HAROLD SUMNER.
9. LESSONS FROM FIRE AND PANIC. A Paper. By THOMAS BLASHILL, F.R.I.B.A., F.S.I., Superintending Architect to the London County Council.
10. HOW TO BUILD FIREPROOF. A Paper. By FRANCIS C. MOORE, President of the Continental Insurance Co., New York.
11. FIRE TESTS WITH UNPROTECTED COLUMNS. A Report by the Committee on "Fire-Proofing" Tests, New York.
12. THE EFFECT OF FIRE. A Report on the Horne Building Fire, Pittsburg, U.S.A., with Fourteen Plates and Illustrations.
13. THE B.F.P.C. TESTING STATION. Some Descriptive Notes, with Illustrations.
14. FIRE TESTS WITH FLOORS. A Floor by the Expanded Metal Co.
15. CONFLAGRATIONS DURING THE LAST TEN YEARS. A Paper, with Twenty-three Maps. By CHARLES E. GOAD, M.Am.Soc.C.E.
16. FIRE TESTS WITH FLOORS. A Floor of Wood Joists filled in with Concrete.
17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington, Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington, Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. A Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke-Breeze Concrete.

[*Continued on p.* 8.

# COUNCIL.

*President:*

. . . . . .

*Vice-President:*

. . . . . .

*Chairman of the Executive:*
EDWIN O. SACHS.

PROFESSOR AITCHISON, R.A., Past-President, Royal Institute of British Architects.

PROFESSOR ARCHIBALD BARR, D.Sc., Glasgow University.

SIR ALEXANDER BINNIE, M.Inst.C.E., late Engineer to the London County Council; President, Incorporated Association of Municipal and County Engineers.

THOMAS BLASHILL, F.R.I.B.A., F.S.I., late Superintending Architect London County Council; Member of Council, Royal Institute of British Architects.

H. H. COLLINS, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division, City of London; Past President, District Surveyors' Association.

SIR W. MARTIN CONWAY, M.A., F.S.A.

ALFRED DARBYSHIRE, F.S.A., F.R.I.B.A., Manchester.

MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., Science Department, South Kensington Museum.

SIR DOUGLAS FOX, Past President, Institution of Civil Engineers.

W. A. HART, Great Western Ry. Co.

SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.

W. H. HUNTER, Chief Engineer, Manchester Ship Canal Company.

SIR HENRY IRVING, D.Lit., Lyceum Theatre, President of the Actors' Association.

SIR NORMAN LOCKYER, C.B., F.R.S.

A. B. MACDONALD, M.Inst.C.E., City Engineer, Glasgow.

SIR W. HENRY PREECE, K.C.B., F.R.S., late Engineer-in-Chief, General Post Office; Past-President, Institution of Civil Engineers; Past-President, Institution of Electrical Engineers.

JOHN PRICE, M.Inst.C.E., F.S.I., City Surveyor, Birmingham.

W. E. RILEY, The Architect, London County Council.

ALEXANDER SIEMENS, M.Inst.C.E., Past President, Institute of Electrical Engineers.

ALEXANDER STENNING, F.R.I.B.A.

SIR JAMES WEEKS SZLUMPER, M.Inst.C.E., F.G.S., F.R.G.S.

SIR JOHN TAYLOR, K.C.B., H.M. Office of Works.

LIEUT.-COL. W. E. M. TOMLINSON, M.P.

SIR W. P. TRELOAR, J.P., Alderman of the City of London.

ROBERT VIGERS, Past-President, The Surveyors' Institution.

*Executive:*
MAX CLARKE, A.R.I.B.A.
FREDERIC R. FARROW, F.R.I.B.A.
CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.
F. W. HAMILTON, A.R.I.B.A., District Surveyor, North Fulham.
F. HAMMOND, F.R.I.B.A., District Surveyor, East Hampstead.
LIONEL J. LANGRIDGE, A.Inst.E.E. (Royal Ins. Co.)
ELLIS MARSLAND, District Surveyor, Camberwell.
ROBERT MOND, M.A., F.R.S.Ed., F.C.S.
EDWIN O. SACHS, Architect, F.S.S., *Chairman.*
JAMES SHEPPARD (North Brit. & Merc. Ins. Co.).
EDMUND WOODTHORPE, M.A., F.R.I.B.A., District Surveyor, Northern Division, City.

*Chairman of the Commercial Section:*
FREDERIC R. FARROW, F.R.I.B.A.

*Solicitors:*
WILLIAMSON, HILL AND CO.,
13 Sherborne Lane, E.C.

*Accountants:*
JAMES AND EDWARDS,
5 Coleman Street, E.C.

*Bankers:*
LONDON AND SOUTH-WESTERN BANK,
Regent Street, W.

*Resident Engineer:*
T. KISSACK.

*Assistant Secretary:*
H. S. TAYLOR.

*Offices:*
1 WATERLOO PLACE, PALL MALL, LONDON, S.W.

## *OBJECTS OF THE COMMITTEE:*

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

---

*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

FREQUENT inquiries having reached the Offices of the Committee as to the character of its Testing Station, the following particulars and illustrations are published with the hope that the information afforded may be useful to the Members and those interested in the work of the Committee.

In presenting Mr. Marsland's notes, I should like to refer to those sentences which explain that the Committee are quite as anxious to undertake investigations with materials and systems that are *not* patented, or in any way subject to special makers' interests, as they are to try the so-called "fire-proof" specialities; but such tests with the *ordinary* materials and methods of construction can only be arranged as the funds of the Committee permit. Several tests of this character have already been undertaken, as may be seen by the published reports. Others will follow, from time to time, as funds permit.

Such general investigations being of the very highest importance to the community at large as well as the professions primarily interested, it is to be hoped that public authorities and allied technical societies will see their way to assist in this matter by subscribing to the Committee's funds. A series of systematic tests is the only way of obtaining the exact and reliable information so urgently required.

EDWIN O. SACHS.

LONDON,
*15th April*, 1902.

# PUBLICATIONS of the BRITISH FIRE PREVENTION COMMITTEE

(*Continued from Second Page of this Publication*).

49. FIRE TESTS WITH DOORS. A 2¼-inch Door of Archangel Deal constructed in Three Thicknesses; a 2½-inch Door of Quebec Pine constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

50. FIRE TESTS WITH DOORS. A 2¼-inch Door of Archangel Deal constructed in Three Thicknesses; a 1¾-inch Door of Teak, Flush Panelling on each side, the Panels being in Two Thicknesses. Particulars of Experimental Fire Tests.

51. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two Fire Blinds, known as the "Williams" Fire Blinds, installed by G. A. Williams & Son, Bayswater, London. The Committee's Report.

52. FIRE TESTS WITH PARTITIONS. A Partition formed with "Mack" Patent Slabs, and erected by M. J. A. King & Co., London. The Committee's Report.

53. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

54. FIRE TESTS WITH DOORS. A 2¾-inch Door of Oak constructed in Three Thicknesses; a 2¼-inch Door of Teak constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

55. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete with Expanded Metal and Plaster Ceiling. Particulars of Experimental Fire Tests.

56. FIRE TESTS WITH FLOORS. A Floor by the Mural and Decorations Syndicate, Ltd., London, being a Double Test. The Committee's Report.

57. FIRE TESTS WITH TREATED WOOD. A Match-boarded Partition of Deal painted with Oil-colour; a Match-boarded Partition of "Non-Flammable" Deal painted with "Non-Flammable" Paint by the London Non-Flammable Wood Company, Ltd., London. The Committee's Report.

58. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

59. FIRE TESTS WITH DOORS. An ordinary 4-Panelled Deal Door; an ordinary Ledged Deal Door. Particulars of Experimental Fire Tests.

60. FIRE TESTS WITH DOORS. Two Iron Doors. Particulars of Experimental Fire Tests.

61. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete. Particulars of Experimental Fire Tests.

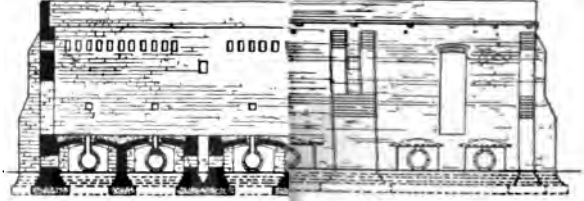
62. FIRE TESTS WITH CEILINGS. A Wood Floor and Ceiling protected by an Additional Suspended Ceiling by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

63. FIRE TESTS WITH PARTITIONS. A Partition erected by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

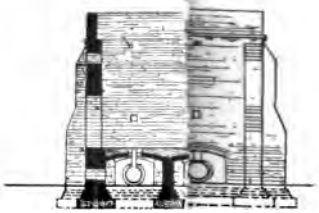
64. FIRE TESTS WITH FLOORS. A Floor by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

65. The Testing Arrangements of the British Fire Prevention Committee. Some Notes with Illustrations. By ELLIS MARSLAND.

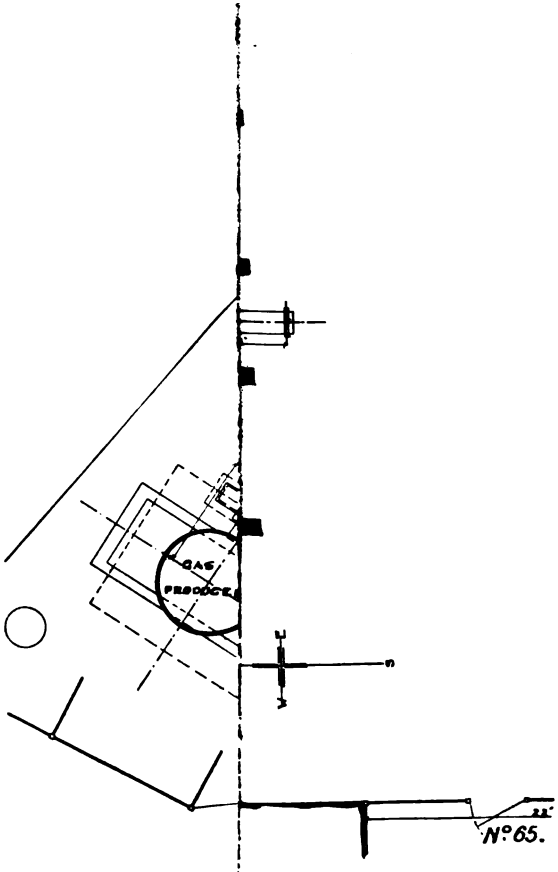
e
e
of
h
t
d
-
o
s
-
r
y
s



SECTION LOOKING EAST ELEVATION.



SECTION LOOKING ELEVATION.




PI

49. FIR
Door
Thick
consti
of Ex

50. FIR
Door
Thick
Panel
Two
Fire

51. FIR
CUR
the "
A. W
Comm

52. FIR
Partit
and e
The (

53. FIR
Parti
Parti
cate,

54. FIR
Door
nesse
Thre
ment

55. FIR
Deal
Exp
ticul

56. FIF
the
Lon
mitt

VIEW OF ENTRANCE TO NEW TESTING STATION.

# THE TESTING STATION.

## INTRODUCTION.

THE object of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire resistance of the various materials, systems of construction, or appliances used in building practice. Such data have not as yet been available, owing to the fact that nearly all investigations in this direction have been carried out by individual makers or inventors with specific commercial objects in view. The few official tests hitherto made in the United States and on the Continent have, unfortunately, been only of minor importance, inasmuch as they were mostly organised to meet some special circumstance, such as the specification of work in a particular building or the framing of building regulations.

The series now undertaken by the Committee not only fulfils a want long felt by the professional man, but gives

"fire-proofing" trades, too, an opportunity to obtain authenticated records as to the reliability of their work.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute impartiality is assured, records being mostly taken automatically, and by photography, while the temperatures are carefully regulated and maintained, as the means for applying heat is by the combustion of gas.

All reports on tests state solely the bare facts and occurrences, with tables, diagrams and illustrations, and on no account include expressions of opinion, nor should any phrase be read as a comparison or criticism.

The general arrangement and direction of the tests is in the hands of the Executive, and in accordance with certain principles laid down after careful study and experiment.

The actual tests are attended by the members of the Council and the members of the Committee in rotation, care being taken that the attendance is always thoroughly representative of the technical professions primarily interested in the specific object under investigation.

The late Testing Station comprised two houses, standing in their own grounds, near Regent's Park, and backing on the Regent's Canal, but, owing to the land being required for railway extension, the Committee was obliged to vacate these premises.

The present Testing Station is at Westbourne Lodge, 66 Porchester Road, Westbourne Park, W., and adjoins the Royal Oak Station of the Great Western Railway.

The premises comprise an old and commodious residence and garden. The principal rooms are used for Committee and Reception Rooms, a Museum, Laboratory and Photographic Dark Room, and also a residence for the Resident Engineer.

A portion of the garden is occupied by the huts in which tests are conducted.

The premises are accessible by rail or omnibus from any part of London, and are in telephonic communication (No. 1555, Paddington) with the offices of the Committee at No 1 Waterloo Place.

With regard to the financial aspect of the Station, the establishment expenses are met by a special subscription and, as far as the funds of the Committee permit, investigations with ordinary (i.e. not patented) forms of construc-

SITUATION OF NEW TESTING STATION

tion are undertaken from time to time, and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subjected to a scale of charges so regulated as to only just cover the actual cost. The Testing Station is also open to Members for such private research work or tests as they may desire to undertake, at nominal charges for loan of plant and instruments.

VIEW OF GAS GENERATOR AND PLANT AT THE OLD TESTING STATION.

The services of the Members participating in the management of the Station, conducting or attending tests, are given entirely gratuitously.

## PLANT.

The plant actually completed comprises a set of testing huts, in which floors, partitions, doors or ceilings can be tested. The huts are laid down in two rows, their construction being explained on the plans and sections illustrated in this publication, as well as by the photographs showing some general views of the plant. The materials used in their construction are stock bricks with lime mortar.

The fuel used is gas, produced on the spot by a generator supplied by Messrs. Mason, of Longsight, Manchester, and a boiler by Messrs. Shand, Mason & Co., of Blackfriars Road.

The gas is conveyed from the generator by pipes to the several huts, and the supply is regulated by valves and dampers, and as the gas enters the huts from the branch pipes it is diffused by means of mixing chambers of fire-brick, as shown.

Each hut has door-openings, ventilation and observation holes, the doors being closed by brickwork during a test, and the ventilation holes blocked, according to requirements, by fire-brick or fire-clay.

Each chamber for a floor test allows for the floor under investigation to be placed at least 7 ft. 6 in. above the floor of the hut, and the chambers are roofed in with galvanised iron, or taupaulin, when necessary.

Bricks or pig-iron are used for any loads that may be applied to floors under investigation, and water is applied from an ordinary manual pump equipped with pressure gauge.

## RECORDS.

Records of temperatures are taken, as far as possible, automatically, by electrical pyrometers designed by Professor Roberts-Austen, of the Royal Mint, and are able to record temperatures up to 2400° F.

A TEST IN OPERATION.

Visual observations as to work under investigation are also recorded, as far as possible, by photography.

Deflections are measured by level and staff, or by weights and pulleys.

## ATTENDANCE AT TESTS.

The general arrangement and direction of the tests, as already explained, are in the hands of the Executive, the

work being done according to certain principles laid down by them after careful study and experiment.

The actual tests are attended by the members of the Council and the members of the Committee in rotation. Attendances at tests have to be strictly limited in accordance with the regulations of the Testing Station, for quite irrespective of the fact that any crowding disturbs those directing the operations, and that the actual attendance is by no means free from danger, there is the question of vibration—for instance, the movements of people in the house are distinctly felt on such delicate instruments as pyrometers.

For the regulation of the attendance at tests, with due consideration for the representation of the Committee—and also of the exhibitor, should it be the case of a patented piece of construction, system or appliance—the following arrangements are in force, and call for attention.

## REGULATIONS FOR THE TESTING GROUND.

1. The official attendance at Tests with materials, systems or appliances of Members of the Commercial Section is limited to :—

*The Council and Executive.*
*Ten Members of the Committee.*
*The Chairman of the Commercial Section.*
*Six Representatives of the Exhibitor.*
*Two Visitors nominated by the Exhibitor.*
*Such special Visitors as the Executive may invite.*

2 Members and Visitors attending will be admitted by a card setting forth the conditions under which they attend, and they must sign an attendance book similarly setting forth these conditions, which are as follows :—

(i.) Members or Visitors attending a Test expressly undertake to in no way, directly or indirectly, publish or allow to be published, any description, account or criticism of the Test. Exhibitors, or their representatives, expressly undertake to in no way, directly or indirectly, publish or allow to

be published, any description, report, account or criticism of the Test, other than the duly authenticated official report of the Committee without abbreviation.

(ii.) Members, Exhibitors or Visitors shall in no way hold the Committee, its Council, Executive or Officers responsible for any personal or other injury, loss or damage sustained at a Test, or while visiting the Testing Station, whether through accident, negligence or otherwise.

(iii.) Members, Exhibitors and Visitors undertake to implicitly conform with the rules in force at the Testing Station, and to comply with all instructions given by the Executive or its representatives.

3. Every Test is in charge of a special Sub-Committee of the Executive, of whom one shall be the Directing Member. The complete technical direction is in their hands, and each Member of the Sub-Committee will wear a distinguishing badge.

4. A Member of the Executive will be delegated at each Test for the reception of Members and Visitors.

5. Members and Visitors will have at their disposal the two rooms known as the "Large and Small Committee Rooms." The room known as the "Lounge" will be reserved solely for the Executive, but all inquiries should be made at the Resident Engineer's Office at the Entrance Hall. All rooms marked "Private" are *strictly private.*

6. (*a*) The Members of the Sub-Committee in charge of any one Test, and the Officers and Employees of the Committee, must not be interfered with during the Test by Visitors and others wishing for explanations or information. (*b*) All inquiries should be put to the Members of the Executive specially delegated to receive Members and Visitors. (*c*) The Executive have powers to determine the distance within which Members and Visitors may not approach the testing huts, instruments or appliances during the progress of any Test. Nor shall any hut be entered or examined without special permission of the Directing Member of the Sub-Committee in charge of the Test, and any such permission shall involve no responsibility on the part of the "Directing Member," or that of the Executive, Council, Committee or its Officers.

7. For the execution of any one Test the Officers and Employees of the Committee will take their instructions only from the Directing Member of the Sub-Committee in charge of that Test, and will be responsible to him for their due execution.

BY ORDER OF THE EXECUTIVE.

## THE COMMITTEE'S INVESTIGATIONS.

In respect to the ordinary building materials or forms of construction which are not subject to any patent or the interest of any special maker, investigations as to their fire-resistance are undertaken from time to time, according to means at the disposal of the Executive for such purposes. It rests with the Executive, either on their own initiative or at the instigation of others, to arrange for tests of this description, and it is hoped that the various public authorities interested in the subject will, in due course, contribute financially towards the cost of such experiments as they may consider of general public utility.

Up to the present the Executive have tested several floors of various constructions, as well as wood and iron doors.

It is needless to say that there are endless questions relating to the fire resistance of ordinary forms of construction that have yet to be solved, and it is hoped that further research will be made in this direction, as means permit.

The Executive hope, in due course, to be able to record the exact resistance of all the more common methods of construction used in the British Isles.

## MAKERS' OFFICIAL TESTS.

As already indicated, quite irrespective of the tests undertaken by the Committee with work that is not subject to patents, or not the speciality of individual makers,

the fireproofing trade also have every opportunity for obtaining official and independent reports on their systems or appliances at a fixed tariff, the charges being based on the actual cost of such tests. Should the Executive find that these testing charges leave any material surplus, such surplus will, after due consideration of wear and tear of plant, instruments, etc., be utilised for improvements in the Committee's plant; but as a matter of fact experience has

WRECKAGE LAID OUT FOR INSPECTION.

shown that the charges only cover the expenses of the testing station when numerous tests are being carried out at short and regular intervals, whilst a loss is made on tests requiring special preparations.

The tariff reads as follows:—

For purposes of finance, the cost of the tests is divided into:—I. Preliminary expenses; II. Establishment capital; III. Testing charges.

All firms or individuals, not members of a firm desiring tests,

shall contribute a donation of £5 5*s*. to the preliminary expenses incurred by the British Fire Prevention Committee in forming the station.

All firms or individuals desiring tests shall contribute to the establishment capital of the station from £10 to £50, according to the nature of the test and the group to which it belongs, as defined below.

All firms desiring tests shall pay in form of testing charges

VIEW TAKEN DURING TESTING OPERATIONS.

from £50 to £125, according to the nature of the test and the group to which it belongs, as defined below.

These contributions and charges will cover all expenses for ground, carcass, walls, ovens or heating apparatus, instruments, firing, loading, water, attendance and supervision, and on no account shall any other expense be incurred; gratuities to the servants of the Committee, for instance, being strictly prohibited. No responsibility for breakage of instruments, etc., is incurred.

The firm or individual having work tested shall supply and fix

his materials, systems, or appliances at his own cost, everything pertaining to the actual test being covered by his contributions as per scale.

The following classification of tests has been decided on with the view of fixing the contributions :—

Group A. Tests with built-up walls, floors, partitions, etc., safes, etc., intended to endure severe tests.

Group B. Tests with built-up walls, floors, partitions, etc., with plaster, special lathing, etc., and intended to stand medium tests.

Group C. Tests with individual pieces of material, with sprinklers, individual fittings, such as doors, glass panels, skylights, etc.

Group D. Tests with automatic appliances, such as fire-alarms, etc.

When second tests are desired by the same firm or individual the testing charge—no matter in what group—will be according to scale, but there will be no further contribution to the establishment capital or preliminary expenses. Where three or more tests are undertaken for the same firm or individual a discount of 10 per cent. off the scale charges will further be allowed. All contributions are payable in advance at such times as the Executive shall determine.

Before any test with any materials, system or appliance is started, or the arrangements for such a test are commenced, all contributions shall have been paid in advance, and the ordinary application for a test shall have been supplemented by an undertaking on the part of the firm or individual desiring the test, to accept all or any reports of the Committee, framed on the lines indicated above, and further to permit the Executive to issue such reports. The undertaking shall be on a form obtainable at the offices of the Committee. Any firm or individual, however, desiring to see the report on a test with his work prior to issue will always have an opportunity given him for this purpose.

Under exceptional circumstances, at the discretion of the Executive and under special conditions to be determined on, tests may be undertaken elsewhere than on the Committee's grounds.

The sum total of the contributions of an individual or firm undertaking a test in a single chamber will be as follows for any one of the four groups:—

| Contributions for: | GROUP A. Tests with built-up walls, floors, partitions, etc., safes, etc., intended to endure severe tests. | GROUP B. Tests with built-up walls, floors, partitions, etc., with plaster, lathing, etc., intended to stand medium tests. | GROUP C. Tests with individual pieces of material, with sprinklers, individual fittings, such as doors, glass panels, skylights, etc. | GROUP D. Tests with automatic appliances, such as fire-alarms, etc. |
|---|---|---|---|---|
| | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| I. To preliminary expenses | 5 5 0 | 5 5 0 | 5 5 0 | 5 5 0 |
| II. To establishment capital | 50 0 0 | 50 0 0 | 25 0 0 | 10 0 0 |
| III. To testing charges . | 125 0 0 | 100 0 0 | 75 0 0 | 50 0 0 |
| Total . . | 185 5 0 | 155 5 0 | 105 5 0 | 65 5 0 |

## MAKERS' PRIVATE EXPERIMENTAL TESTS.

Quite irrespective of the independent tests, the testing grounds are, under special conditions, available to members

THE INSTRUMENT ROOM.

of the Section for private experiments, private investigations, etc., and research work of a private character.